SUSTAINABLE DEVELOPMENT OF REAL ESTATE

MONOGRAPH

Editors A. Kaklauskas, E. K. Zavadskas, R. Dargis, D. Bardauskienė

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VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

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Research, theoretical and practical tasks of sustainable real estate development process are revised in detail in this monograph; particular examples are presented as well. The concept of modern real estate development model and a developer is discussed, peculiarities of the development of built environment and real estate objects are analyzed, as well as assessment methods, models and management of real estate and investments in order to increase the object value. Theoretical and practical analyses, presented in the monograph, prove that intelligent and augmented reality technologies allow business managers to reach higher results in work quality, organize a creative team of developers, which shall present more qualitative products for the society. The edition presents knowledge on economic, legal, technological, technical, organizational, social, cultural, ethical, psychological and environmental, as well as its management aspects, which are important for the development of real estate: publicly admitted sustainable development principles, urban development and aesthetic values, territory planning, participation of society and heritage protection. It is admitted that economical crises are inevitable, and the provided methods shall help to decrease possible loss. References to the most modern world scientific literature sources are presented in the monograph.

The monograph is prepared for the researchers, MSc and PhD students of construction economics and real estate development. The book may be useful for other researchers, MSc and PhD students of economics, management and other specialities, as well as business specialist of real estate business.

The edition was recommended by the Committe of Studies of VGTU Faculty of Civil Engineering.

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INTRODUCTION

Sustainable development is not possible without growth in real estate that provides facilities for all human activities while improving the public spaces in our cities and towns. Current developer-professionals require interdisciplinary information and a level of qualification that can assure the stability of developed products, economic effectiveness and quality. The authors of this monograph on the sustainable development of real estate want to prompt creativity in developers and form public responsibility by sharing their accumulated know-how, the results of scientific studies and their practical insights with readers. Furthermore they seek to encourage a multi-level history on the evolvement of cities, aesthetics of public spaces and the continuance of values relevant to natural and cultural heritage, culture and traditions. A great deal has been written on the different elements involved in the process of real estate development in a variety of literary sources. This book provides integrated information along with practical examples that assist in assuring. Although economic crises are unavoidable, the opinion here is that effective management of real estate projects makes it possible to lessen losses. This monograph consists of six chapters.

Many models and methods for the analysis of real estate development and their constituent parts have been developed worldwide and discussed in the Chapter 1. Theoretical Model of Real Estate Development Process is claimed that currently real estate development is not merely an activity involving investments or engineering but it is also a creative, scientific and artistic effort under the influence of the external environment. Real estate development involves numerous aspects that should be considered in addition to making economic, business, provisional, technological, technical, organizational, managerial and legal/regulatory decisions. These must include social, culture, political, ethical, psychological, educational and environmental aspects. First chapter presents a model for such considerations and discusses certain composite parts of it. The theoretical model must be applied with a creative consideration of the external factors in developmental area as well as the needs of the market and of society. Examples of the composite parts of real estate development process are provided. Various interested groups participate in the process of real estate development under market and democratic conditions. A developer must negotiate and select a suitable strategy with such groups. The research object of these chapters is a real estate development life cycle, stakeholders striving to attain their goals and micro, meso and macro environment making an integral whole. A comprehensive research into the above object required the development of new methods and models of project multiple criteria analysis enabling the user thoroughly assess its economic, technical, qualitative (i.e. architectural, social, aesthetic, emotional, ethical, comfortability, etc.), technological, environmental,

legislative, infrastructural and other aspects. The diversity of the factors being assessed should correspond to the various ways of presenting the data needed for decision making.

At first sight, the subject of investment in property looks anything but complicated. However, such an attitude changes after a more thorough analysis of the issues related to this area. Recent books and publications on investment in property (real estate investment) are abundant, and certain topics appear in more than one text. As an example, we briefly list several typical topics that are related to investment in property and repeated in many texts, e.g. investment goals, comfort zone, real estate values and trends, location, land use regulations, investment options (apartment complexes, hotels, office buildings, shopping centres or industrial buildings etc.), microlevel investment analysis, macrolevel real estate investment issues (portfolio theory and institutional landscape etc.), measuring investment performance, management of investment processes, real estate development, risk appraisal techniques, valuation models, real estate transaction, buying techniques, negotiation, forms of ownership available to investors (partnership, corporate ownership, syndication, land trusts, limited partnerships), financing techniques (second mortgage, adjustable-rate mortgage, fixed-rate mortgage, reverse mortgage, balloon mortgage, assumable mortgage, leverage, creative financing techniques), financing strategies (how to be at the right time and at the right place etc.), tax benefits and foreclosure, etc. These issues are dealt with in the Chapter 1.

Chapter 2, "Real estate development" submits that growth in real estate development is a business of multiple aspects encompassing operations from the renewal of existing buildings and re-rentals to the purchases of undeveloped land and sales of developed lots. The persons who engage in such developmental growth are the coordinators of these operations. They convert ideas on papers into real estate. They are the people who create, imagine, control, finance and line up the entire process of expansion from beginning to end. Growth in real estate is an organic process. There are no two completely identical projects, because the circumstances change constantly. The people who engage in expansions usually purchase plots of land, determine a targeted market for them and implement construction programs and projects upon gaining approvals and financing from the community and then lease, manage and ultimately sell them. The real estate sector is divided up into five products: residences and offices and commercial, industrial and agricultural properties. The market for each of these products differs depending on the locale. A developer is obligated to manage at least one type of these properties: land, information, tenants (buyers) and capital. If a developer dispenses more than one of these products, the task of expansion becomes easier. If a developer has a lot, then supply determines the task at hand; suitable use of the lot must be found. If one has information

or tenants (buyers), then demand determines the task; a lot is sought for that purpose. The developer has choice when there is capital. A market analysis is undertaken in advance to determine a market niche and the product or products to fill that niche. The life cycle of real estate is divided into four stages: recovery, expansion, increased supply and recession. In the real estate sector, it is very important to select the time for development appropriately. The claim that "selecting the right time is everything" is perfectly applicable here. It is not possible to overemphasize the importance of the real estate life cycle. A developer increases the probability of success if he/she synchronizes efforts with the cycle. A project that is started at the positive start of the cycle means there is less competition. Real estate buy-sell transactions are highly sensitive to changes in interest rates. Property that generates income (offices, production plants, retail stores, multi-unit residential buildings) provides insufficient income for financing when the interest rates rise to a certain level. Real estate designated for selling (residential domains, office buildings or multi-unit residential buildings) suffer from greater financing expenses when the interest rate is rising. Buyers are inclined to wait for interest to drop, when the rates are high. Nonetheless, the real estate cycle generates greater possibilities for financing and stronger demand than supply. Furthermore inflation at a double-digit level generates good conditions for investing in real estate, because it is one of the best ways to insure oneself from inflation. The regulatory means that governments employ affect the time and expenses involved in real estate development. Knowledge of all the subtleties involved in processing documents markedly decreases the expenses of implementing a project. The land lot is another significant factor. It is very difficult to utilize an unsuitable lot purchased in an unsuitable location. Therefore it is essential to perform a market analysis prior to purchasing a land lot. The significance of the technology in the area of the real estate is huge. It provides real estate professionals with the opportunity to manage a project from its conception and design all the way to its marketing, mediation, real estate management and financing.

Chapter 3, "Crisis management in construction and real estate", claims that transformations in the real estate sector are constant and unavoidable. The global real estate crisis that occurred at the start of the twenty-first century shoved more than one operator out of the market. It nudged others to seek new, more effective methods and places for operations as well as a new outlook on the relationship between price and expenditures. These authors provide recommendations for more effective transformations in real estate sectors. Different countries frequently select different strategies and tactics in their efforts to lessen the effect of a crisis in construction and real estate. This is entirely natural due to their different economies and markets as well as legal, institutional, technological, technical, cultural, psychological, ethical and other kinds of aspects.

Traditional crisis analysis in the construction and real estate sector is grounded on economic, legal, institutional and political aspects. Less attention is paid to social, cultural, ethical, psychological, religious, demographic, spiritual and educational aspects of crisis management. Thus a more careful look was taken on these qualitative aspects in this work and developed decision support systems.

Chapter 4, "Sustainable real estate development and assessment", claims that chaotic urban development, non-renewable resources and energy saving, climate change and etc. are the main reasons for the sustainable real estate development. Currently, the process of real estate development is dominated by applied the sustainability principles more and more widely in designing, assessing, constructing, using and demolishing of buildings. The sustainable development basically means that priorities are given to mixed use of buildings, social diversity of people, high quality projects and sustainable buildings. A real estate taxation system influences urban development and a single land value tax can promote sustainable real estate development. There are a lot of SAS (sustainability assessment system) created in the world which are used for assessment of one or another aspect of sustainable building development – environmental, economical or social. However, there are not many systems that cover all components as equally significant. Most of the systems do not sufficiently cover the social, economical and institutional aspects of sustainability; the criteria significances, assignment of credits and final assessment are ambiguous and have drawbacks. The recreational complex RE sustainability assessment model allowing assessment of the aspects of sustainable construction – environmental, economical and social – as equally significant has been created. This model has been created using the expert, breakdown and AHP methods. Based upon the model offered, there has been created an SAS for recreational complex RE covering the groups of the main and additional criteria with the set significances, difference between credits, overall evaluation in percentage terms, minimum credit requirements and establishment of the final sustainability rating. The recreational complex RE SAS would enable the sustainable development thereof, it would help to reduce the use of natural resources, CO_2 emission, stop the climate change, increase the use of recoverable energy sources and improve the quality of life.

The authors of the Chapter 5 aim to answer the question of why aspects of socio-cultural expansion (history of city evolvement, current strategies of sustainable development, urban policies, territorial planning, organization of an aesthetic city and environmental protection, public interest and its participation in the process of city expansion) are beneficial to the real estate developer. Their opinion is that the real estate developer is a multi-disciplinary person who works with representatives of numerous interest groups in an urban environment that has formed by a historical evolvement. Thus the information provided in this chapter will permit taking the most rational position possible when deciding the

outcomes of all real estate development assignments. Also, Chapter 6 acquaints future developers with the assignments and results that constitute the context of the historical evolvement of a city's development. Chapters 5 emphasize that real estate projects are not merely products on the market but they are actually objects of public interest and public space. Thus information is provided to a developer about universally acceptable principles and strategies for sustainable development and the means for integrated strategic and territorial planning.

Chapter 6 contains a discussion on decision support systems and their composite parts, e-business and decision support, data mining and real estate development, text analytics and real estate development, Web-based decision support systems created by authors in cooperation with their associates. Decision support systems developed by the monograph's authors are described in the Chapter 6. These decision support systems comprise of the following constituent parts: data (database and its management system), models (model base and its management system) and a user interface. Presentation of information in databases may be in conceptual (digital, textual, graphical, photographic, video) and quantitative forms. Quantitative information presented involves criteria systems and subsystems, units of measurement, values and initial weight fully defining the variants provided. The databases were developed providing a multiple criteria analysis of alternatives from economical, infrastructure, technical, technological, qualitative, legislative, social and other perspectives. This information is provided in a user-oriented way. Since the analysis of alternatives is usually performed by taking into account economical, infrastructure, technical, technological, qualitative and other factors, a model-base include models which enable a decision maker to carry out a comprehensive analysis of the variants available and make a proper choice. These systems, related questions and practical case study were analysed the Chapter 6. Numerous results of scientific investigations for the development of intelligent decision support systems developed by the monograph's authors were announced in reviewed publications containing a citation index, the ISI Web of Science data base at the Scientific Information Institute.

BUSINESS PRACTITIONERS WORD

Robertas DARGIS
President at Lithuanina real estate development association
Chairman of the board at EIKA

Property development starts with industrious, creative people

In countries of eastern and central Europe, business-friendly environments and the concept of a contemporary developer are not yet fully formed. The future property development graduates should, therefore, be ready to work in a constantly changing social and economic setting. Although people increasingly see business in positive light, business people still face attitudes as a relic from the Soviet times, – that business cannot be a fair economic foundation of the state or a driver of progress. Even some officials extend their interest in business only as far as the taxes it pays. The dawn of a new era is usually accompanied by a revision of values and a rise of false prophets, also tales about dishonest "business". But true property developers, entrepreneurs have nothing to do with that. They are drivers of progress and creators of national wellbeing - the taxes they pay and the jobs they create are the backbone of national economies.

Successful business requires a great deal of knowledge and persistence, courage to change personally and transform the business environment. Not everything in business is a success at the first try, but the route to success depends on the vision you choose, on your industriousness and creativity. Uncontrollable circumstances can ruin anyone; you have to come to terms with this and never be afraid to fall and rise again. But it is always worthwhile to develop, be creative in applying your knowledge, and look for new, more innovative solutions. National policies and professional politicians are important to a successful business environment, as is the understanding that stability and the promotion of entrepreneurship is a key guaranty of a better future. Especially now, when countries in Europe and around the world must prepare for the trend of shrinking and aging populations, rising energy prices and national debt repayment.

The crisis – a test and a lesson

The economic crisis was created by the downturn taking loads of money from banks. The flow can be illustrated by a tiny watermill washed away by spring thaw water rushing down the mountains in torrents. Few seemed to realise at the time the evils an economy and inflation growing so fast can breed. Many simply rejoiced that countries in eastern and central Europe were catching up

fast with the economic performance of the West and drawing close to the standards of welfare states. Such was the situation when the consumption and property bubbles were expanding. But today few want to remember that developers had no part in this, that the price of an old, unrenovated flat could increase multifold in a few years; the housing bubble was inflated by torrents of money and the number of people able to take a loan growing almost every night.

As the crisis hit and banks turned off their money taps, everything crashed down in painful agony, together with huge loans, liabilities and human destinies. Uncertainty, anxiety, fast-changing business environment became the reality – not only because of the global crisis, but also because of government actions, growing taxes and an unstable business environment. Such were the affairs as we entered 2009, during which the hardest hit parts of economy were real estate, construction and mass media. By 2010 housing prices fell by up to 60% from their peak and it was almost impossible to sell land. Some were forced by the slump out of business. The crisis taught many lessons, those that remained in the market realised that a failure can be caused both by circumstances beyond our control and by mistakes made because of insufficient experience in the market.

Now the property market has already bounced back and is mildly growing, or rather trying to keep afloat. But looking into the future I suggest to take each experience in a positive light. The money you lose can be considered a fee you pay for an experience that teaches to be more careful and rational. These are the circumstances that constitute the business environment in which developers work today.

Creativity helps to beat challenges

At least three big challenges are waiting for developers in the future; businesses are always the first to notice them and try to take action to be better prepared. The first is demographic changes (Figure 1). In Europe, the population will be declining.

The Baltic states are already experiencing the issues caused by shrinking populations. The findings of an Estonian national development report note that between 1990 and 2010 the overall population in the Baltic states dropped by 1.5 million or 15%. The future forecasts are far from optimistic: populations will age and decline further. Cities in eastern and central Europe are also affected (Figure 2).

The second challenge is energy and infrastructure. By 2030 the population of our planet is forecasted to reach 9 billion and all these people will need electricity and fuel. Thus hardly anyone expects that energy resources will become cheaper in the future. Their prices will be going up faster than we wish. It is therefore time to admit frankly that urban development is our future. Figure 3

shows that the demand for public investment remains high and, in view of population variations (Figure 3), efficiency improvements of the existing infrastructure, thus, remain a relevant topic. It is necessary to make the best use of the existing urban infrastructure that ensures good quality of life and to support public-private partnerships.

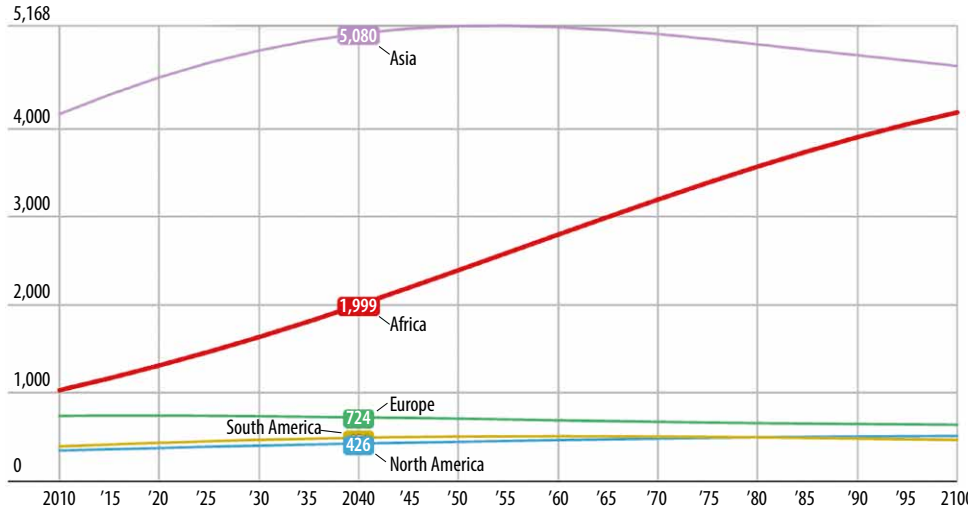

Figure 1. Population forecasts by continent (million)
Source: United Nations

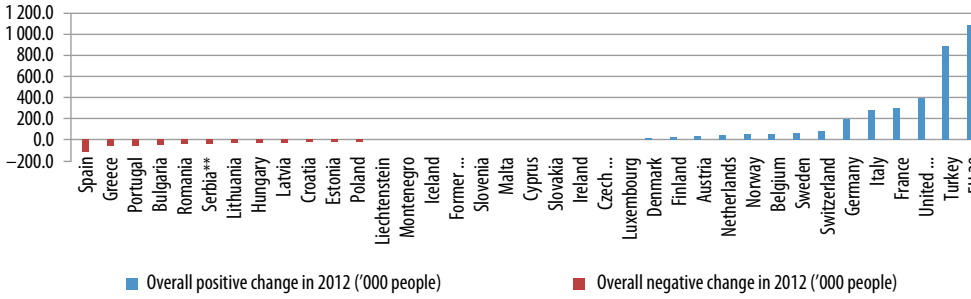

Figure 2. Population changes in 2012 ('000 people)
Source: Eurostat

The increasing costs of commuting and underdeveloped infrastructure are likely to render the sprawling suburban development, which started during the property boom, less attractive. We need to look for new financial and technological solutions for sustainable urban development inside cities. It is a good sign that after the crisis consumers are now pickier and appreciate sustainable construction projects inside cities more.

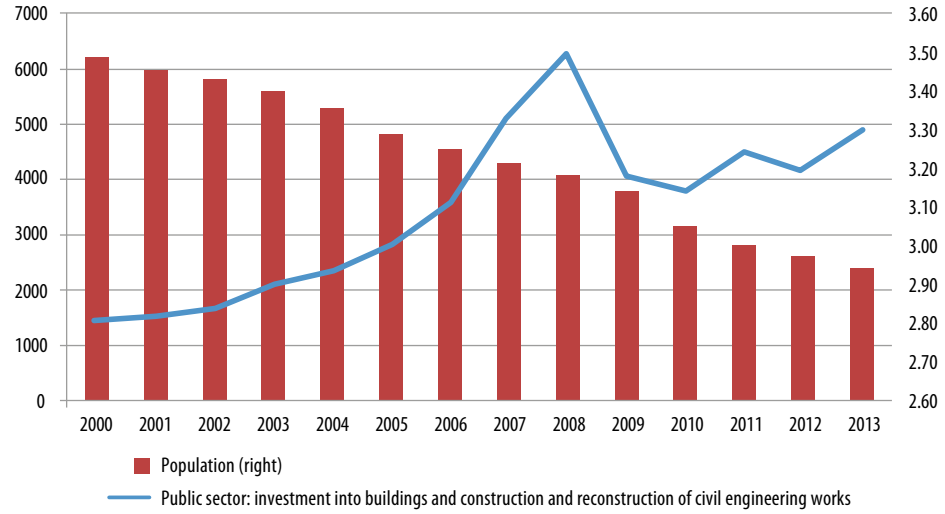

Figure 3. Lithuania's public investment in infrastructure (LTL million) and population (million)
Source: Statistics Lithuania

A stable, transparent, clear and simple tax system remains very important – it is one of the biggest values in the development of property business. The duty of civic-minded businesses aiming at national progress is not only to pay taxes and create jobs, but also to push for a stable tax system that makes a place attractive to local and foreign investors.

Public-private partnership

Developers cannot offer people everything they need. Nor the public sector alone has the capacity to provide people with vital infrastructure. Figure 4 shows that before and after the crisis public investment into infrastructure was growing faster than the investment of businesses and the economy in general.

Around the world, a widely popular measure to satisfy the demand for public infrastructure investment are projects based on a partnership between public and private capital, or PPP (public-private partnership). Private capital brings efficiency to the implementation of public projects and simplifies their risk assessment. The PPP project development model is, therefore, increasingly applied: in the past ten years, the number of public projects financed by private capital surged fivefold globally. In the past five years, private investors poured into them US$300 billion. Compared with traditional projects, PPP projects usually have lower implementation costs. Studies show that in Britain, where as many as 80% of national infrastructure projects are based on private funding, the costs of

PPP projects are 30% lower. PPP projects also enable adequate risk distribution, which means lower risk management costs.

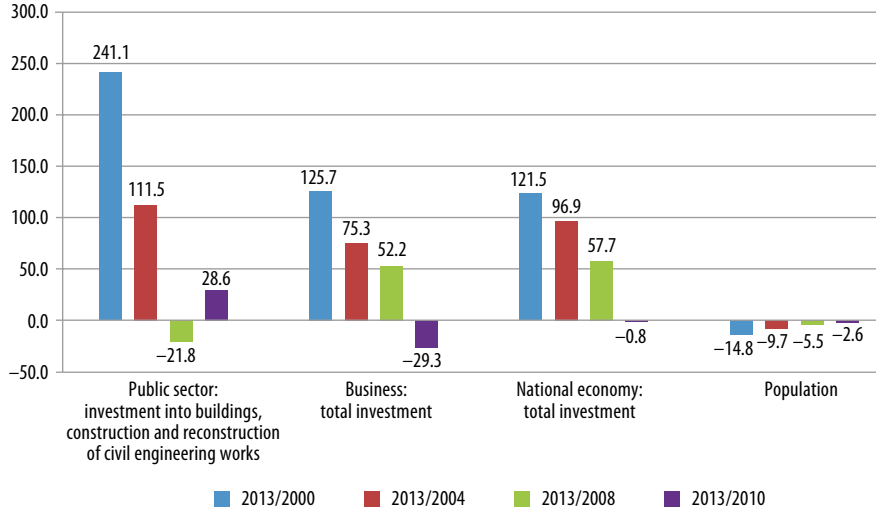

Figure 4. Change in investment in Lithuania (%)
Source: Statistics Lithuania

One of the key advantages of PPP projects is quality assurance. In PPP-based projects, private sector undertakes to assure long-term quality of a building or structure for further 20–25 years after its completion, for instance. This means that after a 25-year contract expires, the building or structure passed by the private sector to the public sector will still be of high quality. PPP projects are also more likely than traditional projects to stick to the contractual timeframe and budget. A study by Standard & Poor's, a US financial company, shows that as many as 88% of PPP projects are completed on time and within the budget. In case of traditional contracts, however, the share statistically barely reaches 30%.

PPP projects are implemented step-by-step; the usual procedure is to choose which project will be based on the PPP model and then to organise a tender and choose a private entity that will implement the PPP project. It usually includes an investor and operator, a builder and a creditor. The parties then sign a PPP contract and the initial investment and construction start. When the construction is finished, the private sector provides the contractual services for the entire period agreed. The services include renovation of the building or structure and its supplies and other means to maintain the quality of the building or structure as agreed. When the contract expires, the property passes to a public entity. The PPP model is applied in transport, education, healthcare, social insurance, culture, tourism, public order, public protection and other projects foreseen by laws.

Only a professional real estate specialist can offer top-quality services for PPP projects. Incompetence is costly; it is also important to note that in eastern and central Europe the end of the 20th century was characterised by widespread shadow economy, also by lack of professionalism, elementary business ethics and responsibility, not only in the property market, but in other national industries as well.

A broader perspective

If we take a broader perspective, the creation of wellbeing starts from a vision, strong people, strong communities, and strong municipalities. In the future, perceptions will change and everybody will contribute more to the growth of urban wellbeing. Although a large portion of solutions are in the hands of national authorities, only municipalities can address about 80% of concerns people have. If more functions were transferred to municipalities and no time was wasted to tackle red tape, the energy of an active person would bear fruit sooner.

Each building or structure created by real estate business, each challenge it overcomes paves the way for the creation of sustainable communities. Developers must be open and active on the road to change. Europe and our countries need more jobs, more foreign investment. Entrepreneurship must be promoted to keep the number of those who work higher than those who need support. Only an active, educated and creative person is equal to such challenges, a person bursting with energy for change and future wellbeing.

APPROPRIATE ATTITUDE TO WORK NEEDS FOSTERING

Arvydas AVULIS, Dalia BARDAUSKIENĖ,
Alfredas LAURINAVIČIUS, Mindaugas STATULEVIČIUS

Today real estate development as a profession is becoming increasingly marked by professionalism and increasingly recognised by the public. A mismatch between the work done and the market needs costs hundreds of millions in losses. A developer, thus, needs a thorough education and a good knowledge of social, economic and environmental trends that determine or can determine future property prices, both at home and abroad. In the old Western countries or the USA, the developer's profession has long traditions and masters of this field are highly respected and valued. Such recognition, no doubt, is only achieved by setting the bar at top professional competence. A contemporary developer is a specialist well-versed in all property market processes: from the twists and turns of territorial planning, available ways to change a building's purpose, the legislative framework, the tax and legal system and economic factors to good understanding of human psychology.

First of all, each young person should find his or her calling: not everyone is meant to be a poet, a CEO, or a designer. No matter the talents, if someone has chosen the right profession, the person feels motivated to work, create, develop and move forward. Today a lack of such motivation is especially prominent in the labour market. Even in the times of slump we are always in search for employees. In recent years we changed our hiring system thrice and today we focus on personal motivation, readiness to work and desire to achieve set goals.

Fresh university graduates are often not ready for jobs, because academic degrees provide ample theoretical knowledge, but very limited practice. But it is practice that reveals whether the student chose the right profession, whether the student wants and can do such work and is able to apply his or her theoretical knowledge. Real life situations often expose that even graduates can struggle with a simple task, such as choosing a contractor or making a plan. Young people should consider themselves which areas are the best to apply their abilities. Human talents must be spotted much earlier; thus, first of all, we need a good career guidance system that would push children with certain talents in the right direction while still at school. One reason why the existing system is far from perfect is that universities base their admission only on grades, but not on motivation and personal traits.

Not everyone can become a top manager, but all can follow their vocation, look for the right niche in the extensive property development sector and

become the best. All societies need talented, devoted specialists. If you are the best in your field, you will never be without work even in the toughest times, while someone in a wrong position rarely stays long, soon loses motivation and desire to move forward or dedicate time to development and challenges. The organisations that are members of the Lithuanian Real Estate Development Association look for people able to do this. They look for talented, persistent, knowledge-hungry people with goals and born to work in property development and construction.

A few years ago our organisation launched a massive hiring campaign and selected only three from a pool of 300 applicants. Today only one continues with us. In part, our tactics to choose young, promising people did not work. The following year we were looking for employees among leaders of student communities – the most talented creators, stand outs with their organisational skills. This approach, however, also failed to produce the desired effect. Once more we realised that lack of career counselling means young people choose wrong professions: many newcomers want to be leaders but struggle with process management and task delegation and cannot take responsibility for mistakes. If we see that someone is a talented analyst, we offer a corresponding job.

Having tried the aforesaid approaches, we now choose our employees by their attitude. We want to gather a team of responsible people, who understand that persistent work can take you high and understand that no job is easy. We give at least five warnings to all newcomers that work in our company is very demanding, but good work pays. Today we, therefore, focus on the attitude of our applicants – on the way they perceive work, the importance they place on career, their views on responsibility. It is very easy to fill in the gaps of knowledge, a few months are enough, but the most important thing is the right attitude. Employers can forgive mistakes, they encourage their employees to make bold decisions, but the main thing is to have a motivated, result-oriented employee who can take initiative to seek results.

Understanding professional activities of the property developer

Property developers are professionally involved in activities that cover many areas. Property developers implement projects that generate profits, contribute to the Gross Domestic Product, create jobs in a range of industries, and shape the built environment and public spaces. The developer is accountable to the public, because its products remain visible and are used for many decades. Development of real estate often happens in an established environment, thus developers need good knowledge of local natural environment and cultural evolution. They also need to take responsibility for the preservation of inherited values. The developer must supply market with sustainable products. So it needs an

understanding of long-term trends of urban development, strategic thinking, and efficient management of the entire property development process. In the 21st century, property development has to be based on universally acknowledged principles of sustainable development (social, economic and environmental) and must consider conditions dictated by climate change (saving of energy and other natural resources, etc.). In democracies, the developer needs skills to debate with various social groups and act as an intermediary between many professions that take part in the creation of the built environment. Overall, the modern developer is a strategist, conceptualist, analyst, manager, intermediary, economic actor, creator and artist.

The evolution of property developers

The developer's profession dates back many years; it emerged together with the built environment. In different countries it has different history and has evolved to different degrees. In old democracies and free-market countries, the property development industry has long traditions dating back to the 18–19th centuries. Highly experienced real estate developers have the capacity to undertake exclusive projects and they answer for the quality of their decisions. Around the world, there are many well-known examples of large-scope modern real estate projects, for instance, the conversion of docklands into modern multifunctional districts in London, Hamburg and Oslo, Orestad mixed-use district in Copenhagen, hotel and commercial complexes in Dubai and many more. Western societies and consumers have financial and legal safeguards, territorial planning, public access to debates on development projects, and the self-regulation culture in property business to protect them against defective real estate products. Western property development professionals gather and develop professionally in public organisations, among which the International Real Estate Federation (FIABCI, www.fiabci.org) is one of the most famous outfits.

In many post-soviet countries, the concept of a property developer is in its infancy, because the sector is very young, developers yet have to build long traditions or gain a legal status, often lack knowledge and practical experience, and consumer protection is work in progress. In countries of eastern and central Europe, the period between 1990 and now can be defined as a transition from centralised to free market. Transitional periods are marked by rapid development of the property sector, which has the capacity to build things that consumers and the public need, such as housing, offices and logistics hubs, and provide related services. But as the global economic crisis hit and the real estate bubble burst in 2007–2008, the development of the real estate sector slowed down.

Property development associations play an important role in professional self-regulation of developers. Such associations are founded by responsible developer

firms. Together they try to write economic activities of the developer into laws, are looking for new business perspectives, and organise trainings and educational events. Such NGOs set as their main goals endeavours to improve business environment, professional development of their members, and making the public aware of property development ideas.

If the property developer is not clearly designated as an independent specialist, it is problematic to formulate qualification requirements necessary for this activity or demand quality from market participants and enforce their accountability to consumers and the public. It is not easy to spot top professionals in the market and measure their contribution to sustainable urban development and climate change. Figure 5 illustrates the Western take on the planning and implementation of real estate projects.

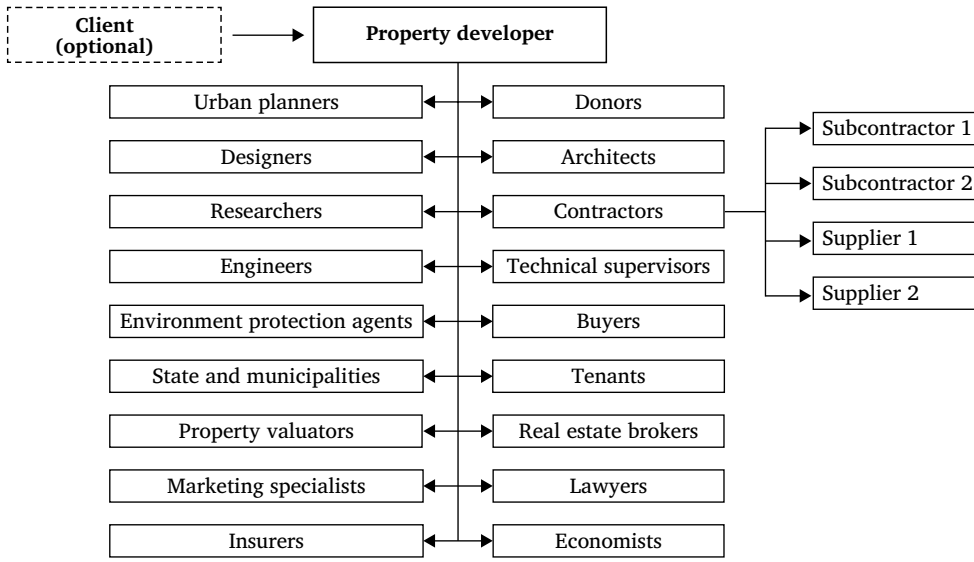

Figure 5. The chart of optimal project planning and implementation (Davis 2007; Kaklauskas, Bardauskienė 2009; Detemmerman 2009)

It is clear from the chart that the property developer has to coordinate and organise actions of all other parties involved in a project. The developer also bears all project-related risks (sometimes projects have a client and then some parties listed in Figure 5, such as buyers, tenants, real estate brokers, marketing specialists and some others, drop out of the picture, but the overall structure remains much the same). But today we still see cases when a client engaged in usual public or commercial activities undertakes to coordinate the project's implementation, which often leads to inefficient process and poor performance.

The main functions of the property developer

Real estate developers can be of all shapes and sizes. Some are gigantic firms and have the capacity to do all of the abovementioned activities themselves. Others are small outfits with a handful of professional staff; they hire outside companies, contractors and subcontractors to do the job. In all cases, however, the success depends on the ability to coordinate different activities and implement them on time, efficiently and within budget.

A project can be initiated by a property developer, in which case the risk to find eventual buyers and/or tenants falls on the developer, or a project can be ordered by a client, in which case the client entrusts the developer to organise and coordinate the entire development process with an aim to build whatever facilities or infrastructure are needed. A vital role of the property developer is to offer businesses and residents an optimal variant of the building's functionality, location and price.

The most progressive property developers, industry leaders and professionals, cover a broad range of activities: they know global trends, they create visions for residential areas and implement them, they foresee several years or even decades ahead what buildings businesses and citizens will need and where. Developers analyse local markets and create innovative products for sustainable development. Property developers are entrepreneurs in constant quest for new opportunities and they make them come true. Property developers take part in the sustainable development process, which contributes to a community's quality of life, harmonious environment and wellbeing. Foreign literature often mentions the following functions of developers and phases of development (Davis 2007; Frej, Peiser 2003; Miles 2000; Clark 2007):

1. **Creating the preliminary concept**. The property developer carries out market research and, taking into account territorial planning documents (the master plan and detailed plans for each block), prepares a preliminary business plan. It can be a top-down preliminary concept, when the firm's strategists and visionaries suggest ideas to analysts, who then take them as a basis for their market research, estimations and business plans. It can also be a bottom-up concept, when an opportunity offers to buy specific real estate a plot of land, a building, facilities or something else and then the firm's strategists get estimates from the analysts and try to come up with a vision of what can be done with the real estate.
2. **Search for a plot, its valuation and acquisition**. The property developer locates a plot that fits the preliminary concept and performs its valuation. The attractiveness of the future project, its relevance to the market and its potential costs are assessed, a preliminary design and construction schedule and budget are drawn up, the project risks are assessed, and the project's financial viability and the return on investment are estimated. If the

valuation proves that the business plan is sustainable and the preliminary concept is sound, the property developer then buys the plot (or takes it on lease or takes into possession and uses in other ways laid out in the laws of the Republic of Lithuania).

3. **Making the detailed plan**. The property developer, depending on its needs and the purpose of the upcoming project, can split or combine the acquired plot and change its purpose by initiating a detailed plan, i.e. can increase the plot's value and adapt for the future needs.
4. **Preparing project management documents.** The property developer prepares the construction schedule and the budget, the sales/lease pricing and the final business plan. All these documents will help implement the project in its entirety (the way it is outlined in the design documentation) within budget and on time. These are the principal criteria in any project. The documents are supervised in other project development phases.
5. **Marketing activities, lease/sales contracts.** The property developer presents the project to the public. It can be articles in the press, promotional campaigns, a website, looking for clients, and signing of lease agreements and/or preliminary sales contracts. This phase can continue well after the construction is completed.
6. **Securing project's funding**. The project is introduced to banks and the developer seeks financial partners for the project. A loan contract is signed; a refinancing of the plot acquisition is possible.
7. **Designing**. The property developer organises designing and coordinates work of architects and designers. It includes:
   – selecting a designer and signing an agreement;
   – controlling and coordinating the designing;
   – preparing technical design documentation;
   – securing a building permit;
   – preparing the work design documentation.
8. **Construction.** The property developer organises construction and coordinates work of contractors, subcontractors and technical supervisors. It includes:
   – selecting contractors and signing agreements;
   – construction investigations;
   – construction;
   – technical supervision.
9. **Submitting to be approved for use.** A finished building or structure is approved for use as follows:
   – inventory and cadastre verification of the building and other structures;
   – collecting necessary documents for the approval;
   – submitting for verification to the authorities;

– registering the building.

10. **Use, lease and/or sale of real estate.** Real estate approved for use can be sold (in its entirety, e.g. a business centre, or in parts, e.g. flats) or the property developer can remain its owner and rent it out (e.g. a warehouse, a logistics centre, an office, or commercial premises).
11. **Quality assurance during the warranty term.** The property developer, within a period prescribed by laws, is in charge of quality assurance, maintenance and defect elimination.

The key functions have been listed here as step-by-step phases of the property development model. In practice, however, several functions from different phases can be done simultaneously or in different order (e.g. the developer may seek funding well before buying a plot or technical design documentation may be prepared together with a detailed plan). In practice there are cases, especially as a real estate bubble starts to inflate, when developers do not care about local development specifics, they only prepare the detailed plan of a plot of land and sell it. Such actions, when the only driver is huge economic gains and profit without any consideration for the consumer or the quality of life, merit the label of speculative behaviour. On the other hand, those that specialise only in plots of land can skip from the third step to the last, which is selling, but activities of such type cannot be considered part of the developer's profession. Importantly, speculations with plots of land earmarked for property development can be dangerous; in post-Soviet countries, they pushed the recent urban development in the direction of a chaotic "urban sprawl", which is at variance with the requirements that ensure good quality of life and promotes excessive use of energy, other natural resources and fertile agricultural lands.

Amateur companies that come to the property market for one-off profits are clearly eager to withdraw from the process as soon as possible; they never care about appropriate technical supervision of construction or submitting their product for the approval to the authorities, let alone quality assurance during the warranty term when their product is in use. Taking a critical look at recent mistakes and achievements and with public interest to ensure good quality of life in mind, we should entrust the property development process to professional property developers loaded with knowledge about all phases and experienced in quality and financial management.

Property developer business and sustainable development

The property market needs a broader look, taking into account such aspects as sustainable development, the quality of life, environmental quality, public interest, urban development, and urban regeneration. Sustainable property development contributes to improving quality of life. The added value it creates often

exceeds its economic value, because it creates social and cultural value that can ensure a continuity of the property developer's actions, social prestige and pride in one's speciality. On the other hand, some developers neglect the principles of sustainable development and add to one of the biggest troubles that plagued the 20th century: construction of low density single-function houses in suburbs, the so-called urban sprawl. Expanding exurban areas with inferior functions and poor aesthetics increase the need for public infrastructure, up the consumption of natural and energy resources and environment pollution, and spoil the landscape. Are suburban settlements of any use if they cannot be accessed by public transport, have no schools, kindergartens or recreational areas, lack works of art, if nobody cares to maintain and beautify them (Kaklauskas, Bardauskienė 2009)? Of note is the fact that the West plunged into the urban sprawl after the Second World War when local populations were growing and the sprawl is more associated with the new middle class and less-affluent people moving to suburbs, because they could not afford life in city centres. Unlike other countries, the situation in Lithuania is different: the sprawl here goes together with shrinking population. The situation is far from menacing it is a rather small-scale expansion but the emerging peri-urbanisation culture is already failing to answer such needs as the quality of life, conservation of natural and cultural resources, growing energy consumption and growing numbers of personal cars. Experts examining the phenomena of the latest real estate crisis see a common trend throughout the EU: too many new buildings in wrong places and too many tall buildings (Bardauskienė 2010).

Sustainable development is a fundamental policy of EU cities and the sustainable city is recognised as a key goal of the future growth in Europe. Property developers must take into account the ideas of sustainable development in European cities laid out in EU documents, such as the European Urban Charter (1992, 2008), the Aalborg Charter of European Sustainable Cities and Towns (1994), the Aarhus Convention (1998), the Leipzig Charter on Sustainable European Cities (2007), the Sustainable Development Strategy for the EU (2009), and the Europe 2020 strategy (2010). In 1994 in Aalborg, Denmark, the Charter of European Sustainable Cities and Towns was adopted, now signed by over 200 cities that pledged to make sustainable development, a vital part of modern urbanisation, their cause. The Leipzig Charter on Sustainable European Cities stresses integrated policy of urban development aiming at vibrant and productive cities, creation of high-quality public spaces, modernisation of infrastructure networks, improvement of energy efficiency, support for efficient and affordable public transport, and social integration policies. The Aarhus Convention foresees the public as co-creators of the environment. The Sustainable Development Strategy for the EU (2009) and the Europe 2020 strategy set forth long-term guidelines for Europe's growth with a view on the demographic trends. These strategies govern the creation of physical environment and infrastructure.

EU urban policies outline the following attributes of sustainable urban development:

- **Compact cities**: to avoid urban sprawl, new projects are developed taking into account the city's character; it can be conversion of abandoned areas, rebuilding, refurbishment and redevelopment.
- **Multifunctional cities**: mixed land use and multifunctional territories.
- **Public infrastructure**: a public transport system, an optimal network of public transport, fewer cars.
- **Conservation and efficient use** of energy and other resources.
- **High-quality environment**: lower pollution and less waste, aesthetic residential environments.

This imposes the need to have property development firms guided by long-term public needs, rather than temporary business and economic gains. Those property developers that fail to grasp the principles of sustainable development soon vanish, but before vanishing they make enormous damage to the life of communities, the environment, the city and the country, a damage that lingers for decades. Successful property developers have long-term, holistic and strategic thinking:

1. **Long-term approach**. Sustainability depends on a long-term approach to decision making. Implicit in the word "sustain" is the desire for human societies to remain healthy far into the future. The future horizon extends far beyond the typical horizon of governmental planning, the next-election focus of the political system, or the next-quarter time horizon of much corporate decision making (Wheeler 2008). A long-term approach cushions outcomes of a crisis (Detemmerman 2009).
2. **Holistic approach**. Sustainable development requires a holistic, interdisciplinary approach to planning. Traffic planning, for instance, is related to land use, housing development, air quality, etc. The coordination and integration of various actions is important when planning real estate at different scales – building, site, district, city, region, and country (Carpenter 2006).
3. **Strategic thinking**. Excessive focus on problems hinders the ability to see and achieve a breakthrough at any level. Drucker, one of the most eminent representatives of modern management, liked to stress that rather than addressing current issues of a managed system, it is important to focus your attention and efforts on identifying new strategic opportunities and their step-by-step realisation. It is like, as Prof. Dr. Smilga puts it, "leaps of imagination, when you look at the 'caterpillar' of all things mundane and manage to see a 'butterfly' shining with the bright rainbow colours of tomorrow—our feasible, desirable and somewhat daunting future" (2009).

Professional self-regulation of property developers: a case of Lithuania

In Lithuania, activities and the concept of the property developer are not defined or legally validated in legal acts, neither are they listed separately in the nomenclature of economic activities, but all major companies operating in Lithuania's real estate market apply the conventional plan of real estate project development. In 2004, to get more involved in addressing various issues related to their professional activities and the course of the real estate industry, 26 property developers founded the Lithuanian Real Estate Development Association (LREDA, www.lntpa.lt) entrusted with the following functions:

1. **Bettering the business environment.** The association offers suggestions on ways to improve legislation, on real estate tax policies, and on economic stimuli.
2. **Professional development of property developers**. Professional development is financed by EU funds and internal resources. The Sustainable Development Academy (2008) acts as an educator: it holds educational events for developers, introduces best practices, assesses the situation, and disseminates progressive ideas to the public.

Dissemination of sustainable development ideas. The objectives of responsible property developers and public awareness are highlighted in the contest *For sustainable development*, an event hosted by LREDA since 2007, in collaboration with Vilnius Gediminas Technical University, the Lithuanian Union of Architects, the Builders Association, and the Consumer Association. Since quality is a product of debates between the public and professionals, the contest promotes extensive publicity and discussion of best practices. In entries submitted for the contest, experts see the dynamics and optimistic reality of urban development and urban architecture. Outstanding projects and top-quality buildings are a way to rejuvenate poorly functioning, abandoned urban spaces and promote the revival of communities. At the same time, the body of best practices of modern architecture, construction and urbanisation is growing.

I. LIFE CYCLE MODEL OF REAL ESTATE DEVELOPMENT

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1.1. Qualitative aspects for the analysis of real estate development

The real estate development life cycle must be analyzed compositely based on a system of integrated criteria in order to examine it in a full-fledged manner (Figure 1.1).

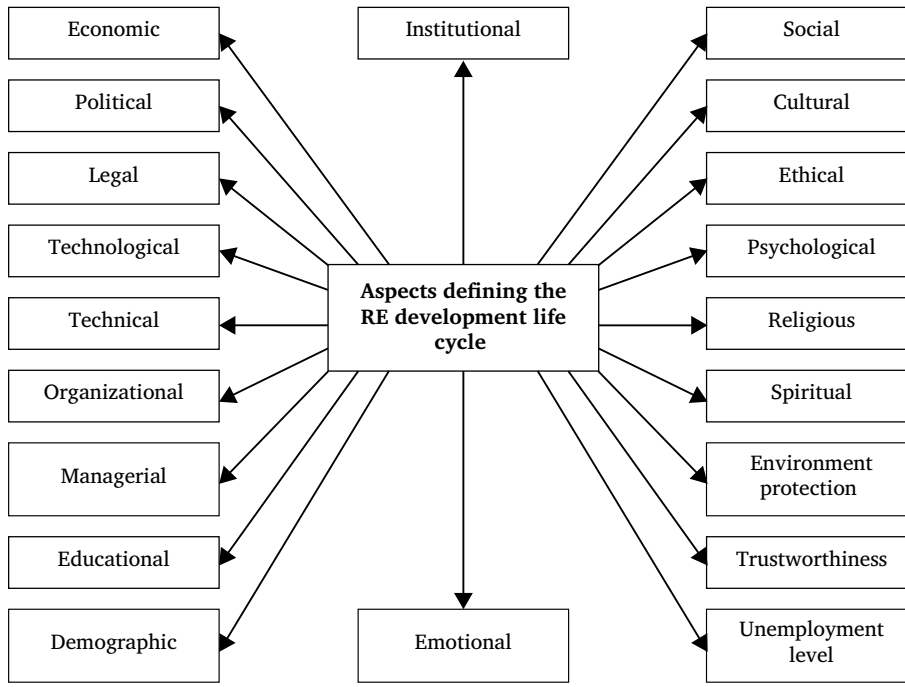

Figure 1.1. Quantitative and qualitative criteria defining the real estate development life cycle

Real estate development involves numerous aspects that should be considered in addition to making economic, political and legal/regulatory decisions. These must include social, culture, ethical, psychological, educational, environmental, provisional, technological, technical, organizational, managerial and other aspects. The following is a short description of some of the qualitative aspects (feelings, emotions, stress, ethics, culture, ethnics, religion, trust, psychology,

policies) for the analysis of real estate development that is provided.

Home is a multidimensional and multiscalar concept that encompasses specific places and feelings. The everyday use of the word 'home' carries considerable emotional weight and is highly evocative of specific feelings, memories, and experiences. While emotions are of significant psychological importance, shaping our personal and social identities, they have not been the focus of traditional housing studies (Murphy, Levy 2012). Murphy and Levy (2012) restrict discussion of home and emotions to research that is centred on houses or dwellings. Murphy and Levy (2012) reflect on evolving conceptualisations of home in terms of housing experiences and practices and Murphy and Levy (2012) chart some broad trends and raise specific issues relating to the emerging analyses of home and emotions. In particular, we review issues relating to home and identity, home and ontological security, the emotional economy of housing, and the nature of emotional decision-making in housing markets (Murphy, Levy 2012).

Burnout is a multidimensional syndrome that occurs primarily in professions where practitioners are subjected to stress associated with direct interpersonal contact with clients. Previous research indicates that working as a real estate broker is a particularly stressful form of work. Considering the potentially harmful effect of burnout on real estate brokers, resulting in a range of negative impacts, it is important to identify those factors emanating from either the individual or their work environment that contribute to this syndrome. (Love *et al.* 2011) present a study that used a questionnaire survey to determine the individual demographics, work and intrapersonal characteristics that affect burnout in real estate brokers. A sample of 305 real estate brokers was obtained in Western Australia. Hierarchical regression was then employed to identify predictors of burnout (i.e. emotional exhaustion, depersonalisation, and personal accomplishment) and sense of coherence (SOC). The analysis revealed the following: emotional exhaustion was associated with lower age, higher numbers of hours worked, and lower SOC; higher depersonalisation was associated with lower age and SOC; higher personal accomplishment was associated with a greater number of visits to clients per week, the presence of postgraduate qualification and a high SOC. The results provide insight to guide health promotion for real estate brokers so as to enhance their psychological and physical well-being, thus making a contribution to improving their overall performance levels and effectiveness (Love *et al.* 2011).

Støa and Aune (2012) suggest an analytical framework for analysing housing cultures, illustrated with examples of research on homes and building processes. Moreover, Støa and Aune (2012) aim to show how interdisciplinary knowledge on housing cultures can be relevant in the discussion of sustainable development and how to deal with the challenges of climate change. Three main barriers are identified against a more sustainable housing culture in industrialised

countries: growing consumption of space and resources, short-term approaches to planning, and increasing demands on comfort. The development of sustainable housing cultures is dependent on a successful coproduction among involved actors in order to define and design environmentally friendly houses and make sustainable domestication processes easy and available. Buildings possess the ability to shape action and values. Just as important is, however, to design housing that is robust and adaptable and as such will enable flexible domestication processes that allow different strategies towards a more sustainable future (Støa, Aune 2012).

Minorities and immigrants are the fastest growing home buying segment in the United States, and are having a significant impact on the marketing of real estate. Of the total U.S. population, 10.4 percent were born in another country. In addition, they're joining a large population of second and third generation immigrants, they have a high desire for homeownership, and many are of prime home-buying age. Although immigrants come from a wide variety of cultures, there is a universal desire for homeownership. Cross-cultural marketing will become the rule of doing business. Experts described the differences between high context" cultures, including North America and Northern Europe, and "low context" cultures such as Asians, Hispanics, Russians and people from the Middle East. Americans of European decent see written contracts as binding, are informal in their business dealings, blunt in their communications and see time as money – they're results oriented. By contrast, low context cultures must establish trust and are relationship oriented. This group sees contracts as a basis for developing relationships, and they use non-verbal and indirect communications. Religious and cultural beliefs also play important roles in real estate transactions. For example, Feng ShuI – the orientation and energy flow of a home and its furnishings – is very important to most Asian homebuyers (Cultural Diversity 2011).

It's important to keep in mind that for many cultures, a written contract is only the beginning of negotiation. Learn how to adjust to others, to communicate effectively across cultural boundaries, and apply fair housing laws to multi-cultural practice. Dealing with other cultures means you may treat them differently on a cultural basis, but you must insure everyone gets equal service and equal access. Experts encourage real estate professionals help reach consumers seeking practitioners who are more familiar with the business practices of different cultures (Cultural Diversity 2011).

Contemporary international migration shows points of departure from the immigration of the past. First, all continents are now significantly implicated in the transfers of populations. Second, there is immense diversity among immigrant characteristics and human capital, including both legal and illegal status, and ranging from the movement of well-resourced cosmopolitans to the flows of refugees who may well be poverty-stricken and without documentation. Third, the

numbers of international migrants are at a very high level. Fourth, destinations are more concentrated than has been the case in recent history, focussed upon large metropolitan centres, or gateway cities, in advanced societies. These are contexts confronting planners on an everyday basis in multicultural gateway cities such as Sydney (Australia) and Vancouver (Canada). Both metropolitan areas share a common economic and cultural history, and their Pacific Rim location has recently strongly affected migration flows as legislative reform opened the boundaries of their nation states to new immigrant origins. While Sydney is a nationally primate city and twice the size of Vancouver, each metropolitan area displays similar processes of economic and cultural transformation (Ley, Murphy 2001). Ley and Murphy (2001) address a number of intellectual and planning questions that have ensued and ask to what extent contemporary immigration is reshaping urban spatial structure, requiring new concepts of urban form and new strategies for service provision. The housing dimension of immigrant settlement has been an important preoccupation of planners, and Ley and Murphy (2001) consider such issues as tenure, affordability, house price inflation, land use conflicts, and the globalization of urban housing markets accompanying elevated immigration in gateway cities. The differential response to immigration among different family members has recently been identified, and Ley and Murphy (2001) address the gendering of immigration and women's mobilisation to secure necessary services. An important institution in shaping attitudes about immigration is the media, and Ley and Murphy (2001) consider its representation of minority groups, including two case studies of media coverage of land use conflicts between immigrants and the long-settled population. Ley and Murphy (2001) argue that it is local government where immigrants typically encounter the state in the delivery of everyday services, and Ley and Murphy (2001) consider the multicultural readiness of local governments in Sydney and Vancouver in serving a culturally diverse body of citizens. Finally, Ley and Murphy (2001) offer some concluding remarks on the challenges of physical, social, and multicultural planning in gateway cities.

Even in the best of circumstances, communication and understanding are risky propositions. So much depends on both parties' ability to slip into the mind of the other. The risks of misunderstanding grow exponentially as we fold in the growing cultural diversity of the United States. As with so many other issues of national importance, property managers are very much on the front lines of the changes reshaping the American cultural fabric. The wrong word, the wrong gesture, the wrong impression can have serious business consequences such as lost clients/tenants, lost relationships and lost opportunities. Every successful real estate professional recognizes the value of maintaining a multicultural workforce that mirrors the backgrounds of all of the above constituencies, most of whom they come into contact with on a regular basis. But recognizing its value

and actively working to create a multicultural environment are two different propositions (Burger 2015).

The main challenge is stepping outside of your own comfort zones of race, religion, color, even sexual orientation, in the hiring process is to recognize the talents, capabilities and potential contributions of people that lie behind your traditional triggers of acceptance. Managers can improve their skills in cross-cultural acceptance by taking a hard look at their own cultural conditioning, examining their experiences with other cultures and watching for the feelings of discomfort that can signal bias. Then, and here is the hard part, they must use this information to modify their approach to communication. With a growing number of foreign investors from Asia, Latin America and Europe targeting U.S. commercial assets, along with the cultural shifts taking place in neighborhoods around the country, sensitivity to cultural differences is critical (Burger 2015). Burger (2015) have been fortunate to have staff fluent in Russian to assist in the day-to-day communication with the occupants of a San Francisco building in the portfolio that has a high Russian population.

India, with its unique social landscape, is driven by numerous religious beliefs and, for most people, they are sacrosanct. To approach the Indian market one has to be mindful about these social realities. One significant trend is of buying during Navaratra and Diwali. In Indian real estate industry, it is common knowledge that one third of the annual sales happen during Diwali. On an average, the festive season stokes up real estate transactions by 25–35%. On the contrary the "Shraadh" period typifies stalemate and a complete lull in the industry. This period is utilized for marketing and research activities to set the ground for sales during festive season starting from Dussehra to Diwali (Realty Trens 2012).

Religion and the expansion of religious sites throughout the built environment have a long and conflict-ridden history (Collins-Kreiner *et al.* 2013). Collins-Kreiner *et al.* (2013) examine the development of three controversial religious sites in Israel that have developed in recent decades in an effort to better understand the kinds of political, social, and locational circumstances that cause some new sites to be regarded as spatially transgressive. The three sites examined here are the Mormon Center in Jerusalem, the Baha'i Gardens in Haifa, and the Church/Mosque in Nazareth. The study is based primarily on 75 structured, open interviews with stakeholders and decision-makers. The broader aim of Collins-Kreiner *et al.* (2013) is to generate a better understanding of the concept of spatial transgression through systematic investigation based on the methodology of "framing". This methodology provides a comprehensive vocabulary for perceptions, referred to as "frames", and offers a detailed and systematic typology of frames based on the literature and the empirical data (grounded research) of the case studies. The main findings fall within the three aggregated superframes identified in the research: "Process," "Values," and "Issues." Of these, the

Process super-frame was found to be dominant in all three cases. Comparing the different frames in the three cases enabled us to identify the factors that influenced the transgression process. It also facilitated a better understanding of the different "stories" involved and the concept of spatial transgression, which was found to exist on a scale ranging from low to high intensity (Collins-Kreiner *et al.* 2013). Collins-Kreiner *et al.* (2013) also proposes a framing typology that may prove useful for understanding and mapping similar cases elsewhere.

The real estate market operates on trust, rather than it being a plain commercial deal. People find brokers, more from word or mouth and references and bestow full trust on these agents. Brokers have a great deal of influence on the decision-making process and house hunting of a common man; hunting a house without a broker is akin to fighting a legal battle without a lawyer. Even though things are changing now, and investors keep a keen eye on the internet platforms that provide reams of data on every locality and project, the final call, however, is made with the "trustworthy" brokers (Realty Trens 2012).

Research on trust in buyer–supplier relationships has tended to focus on the performance outcomes of a trusting relationship, as well as the processes that serve to build trust. Largely absent from the buyer–supplier literature is an in-depth examination of activities that break down trust, and the resulting effect on supplier trust in the buyer. The authors propose and test a model that evaluates psychological contract violations between a buyer and a supplier as a mediating variable of the effect of unethical activities on trust within a partnership. Survey data was collected from 110 tier one suppliers of major corporations in the state of Ohio (Hill *et al.* 2009). Hill *et al.* (2009) results show how a supplier's perception of a violation of the psychological contract either partially mediates or fully mediates the relationship between the buyers unethical activity and the suppliers trust in that buyer. Hill *et al.* (2009) discuss how suppliers may demonstrate bounded ethicality when they overlook perceived unethical behaviors by the buyer (Hill *et al.* 2009).

Real estate markets in Chinese cities are in transition. Advertising for new developments in these markets often reflects changing city aspirations and branding rather than environmental and social experience (Lawson 2013). Lawson (2013) investigates real estate marketing as a site of potential ethical transformation of values related to new urban development. Lawson (2013) uses Kenneth Burke's rhetorical analysis as an approach to coding real estate representations from in-flight magazine advertisements as a means of capturing environmental and social viewpoints in China during 2008–2009. Both Chinese and foreign participants coded representations into four code modalities. These were based on anthropocentric – non-anthropocentric environmental orientations and nationalistic – universal social orientations. The results suggested that new developments in China are more likely to be understood as based on environmental

resource use for continued national economic expansion rather than for a more sustainable world. Emerging patterns in coded representations have opened up the possibility of greater social choices that were however difficult to unambiguously decode from Chinese real estate advertising. From this it is concluded that it may take some time before real estate demand shifts in response to representations of Chinese eco-cities being promoted by Chinese policy makers in the 2000s (Lawson 2013).

During 1965–1974 one million dwellings were built in Sweden, most of these financed by state housing loans and available for renting. Although most of these 850,000 apartments are considered decently maintained about 300,000 are considered in need of thorough refurbishment. This is a great opportunity for technological innovations, contributing to energy saving and climate mitigation on a broad scale. However, many of these estates have also been associated with spatial segregation, social exclusion and related challenges. The empirical focus of this research is on an attempt by a municipal housing company to approach the residents of a multi-family housing estate with a redevelopment scheme expressing a will to combine social, ecological and economic qualities under the brand "My Green Neighbourhood". Drawing upon data describing the initial phase and the dialogue activities undertaken during the planning phase, and the residents' reactions the research is conceptually framed by an eclectic approach inspired by the spatial triad of Lefebvre, Relph's notion of place identity, and Arnstein's ladder of citizen participation, including references to some related, recent works. Considering a common picture of municipal, multi-family housing in Sweden as a "success story" the case study is of relevance in the wider context of coping with the challenges of sustainable urban development. It is concluded that projects like this have a potential to decrease energy consumption substantially, as well as contributing to long-term financially sound management by housing companies. However, when it comes to social aspects of sustainability the picture becomes more complicated. First, most sitting tenants would have preferred a change in terms of proper maintenance and modest improvements. Second, most of them will not return to their apartments after rehabilitation, partly due to rising rents. Third, the position of the tenants was not very strong, instead planning rather had a tokenist bias. Fourth, the local government's social mix strategy has to be questioned on theoretical as well as empirical grounds. Despite these and other critical observations, My Green Neighbourhood should not be disregarded as just one more in a never-ending parade of low impact ad hoc projects. Up-scaling the experience of this and similar running projects would represent a substantial contribution to urban sustainable development, at least in terms of energy saving. Finally, to understand the complexities of a redevelopment planning process it is concluded that decision-makers have to be very observant of the different time perspectives linked to the structural positions and

interests of the various stakeholders, for example a building company's desire to make short time profits through major reconstruction, sitting tenants' demand for sustainable maintenance and cautious refurbishment, local politicians wish to create another social mix in the area, and a public housing company's attempt to reconcile the views of different actors (Gustavsson, Elander 2015).

Pal and Vliet (2012) offer an overview of the evolution of housing policies in developing countries since the 1950s. It is designed to complement many of the articles throughout this volume and provides an outline of public and private production of housing in both the formal and informal sectors. Mostly privately produced throughout the twentieth century, state-sponsored housing only began to be a feature significant in most countries from the 1960s, and even then it was limited in scope until interventions in the (low income) informal sector quickened from the 1980s onwards. Housing policies and their implementation track are embedded within the particular models of economic and political development adopted by countries, and more recently in the changing paradigms of liberalisation which emphasise decentralisation, greater urban sustainability, and greater efficiency of urban management and city planning. Today, new policy approaches are required that will address issues such as 'Rights to the City', renting, inheritance, sustainability, 'green' solutions, and housing rehab – areas in which policy-thinking often remains at best incipient (Pal, Vliet 2012).

The recent history of planning policy in England leaves the treatment of housing supply in a confused position. Much depends on the analysis of evidence on the current and future need and demand for housing for groups of inter-related localities. Arguably the most appropriate spatial scale of analysis of market adjustment processes is the functional urban sub-region, and this article discusses the development and application of an economic market model at this level, applied to c. 100 functional housing market areas across England. This goes beyond most previous analyses of UK housing markets, which have lacked explicit treatment of land-use planning and the supply process, while also recognising the economic and supply influences on demographic change. Based mainly on short-medium panel datasets and some micro surveys, component models for migration, household formation, prices, rents, and new construction are estimated and combined with simpler labour market and demographic accounting to build a simulation model which can explore the potential impacts of economic, demographic and planning policy scenarios. Through a range of examples applied to groupings of sub-regions, and two local case studies, this paper focuses on the way housebuilding, demographics and markets adjust to local decisions and the implications of this 'outcome-oriented' approach for planning. The results confirm a wider literature in showing that planning restriction raises housing costs, but underlines that the effects are quite gradual, particularly given the rather partial response of new housebuilding itself to planning decisions. They also

show the interdependence between nearby sub-regions, and the likely adverse effects of leaving decisions to the local level, as well as the somewhat mixed impact of different levels of economic growth (Bramley, Watkins 2015).

One central aim of climate change mitigation in the European Union is to reduce energy consumption in the housing sector. In order to ensure effectiveness of policies targeting household energy conservation, it is important to investigate existing energy practices of different social groups (Schaffrin, Reibling 2015). Schaffrin and Reibling (2015) describe and explain energy practices in three leading states in environmental politics, technological innovation, and support for renewable energy production: Denmark, Austria, and the United Kingdom. Based on a longitudinal analysis of housing utility costs from the European Community Statistics on Income and Living Conditions Schaffrin and Reibling (2015) show that income plays a central role in households' energy practices. While high-income households have higher overall energy consumption, low-income groups spend a larger share of their income on utility costs. The variation of energy consumption across income groups is related to household characteristics, characteristics of the dwellings, and cross-national differences in the housing sector (Schaffrin, Reibling 2015).

Zhang and Rasiah (2014) analyse institutional change and its consequences on the conduct of state owned enterprises (SOEs) in China's housing sector since reforms began in 1978. Three distinct phases can be identified. In the pilot phase of 1978–1988, SOEs became producers and distributors of houses. In the second phase of 1988–1998, SOEs focused on the resale of public houses and became important contributors to the housing provident funds. In the third phase since 1998, SOEs expanded their role to become developers, investors and speculators in the housing market. The transformation of the urban housing sector from in-kind provision to market-based allocation helped turn losses made in the past to profits. The autonomy and the infusion of private modern management principles have stimulated upgrading in the construction and designing technology of houses developed by SOEs. However, as instruments of the state, SOEs still function as providers of social welfare to urban dwellers by promoting affordable housing to the poor, which shows that the state has remained central in balancing private and public interests in the housing market (Zhang, Rasiah 2014).

Every government in Latin America, and many beyond, is convinced that the only house worth having is a home of one's own. Most have improved housing credit facilities and introduced subsidy policies to help the poor obtain their dream. Unfortunately, few subsidy programmes have been effective and the housing shortage has almost always risen. In 2012, the Colombian government responded to this problem by introducing a radical housing policy. It announced that it will provide free homes for 100,000 families every year. Such an approach appears to be unprecedented across the world (Gilber 2014).

Gilber (2014) examines why the Colombian government adopted this policy and evaluates its chances of success. The article is concerned particularly with the question of whether providing free housing is the most effective way of helping the desperately poor. It is concerned with evidence that previous programmes to subsidise the cost of formal housing have not helped the poor. In particular, they have provided poor quality accommodation, failed to provide adequate services or a decent living environment, and have sometimes contrived to create the problem neighbourhoods of the future. Offering families a home for nothing does not solve the fundamental problem facing the poor – their very low incomes (Gilber 2014).

Despite the close relation between housing and government policy, housing policy forms quite a specific element of the welfare state. Moreover, the position of housing within the welfare state is far from obvious and has provoked a good deal of discussion. This article pays attention to the way housing could be incorporated in the welfare state theory of Esping-Andersen and how this could be related to the development of the social rented sector in Europe. On the basis of the results of this elaboration, the welfare state typology of Esping-Andersen could be modified (Boelhouwer and Hoekstra. 2012). In addition to liberalism, Boelhouwer and Hoekstra (2012) distinguish three kinds of corporatism: labour-led, conservative, and modern. Conservative corporatism corresponds with corporatism as defined by Esping-Andersen, whereas modern corporatism refers to a style of governance whereby the central government switches to a more indirect mode of governance, by defining the policy frameworks within which the local authorities and the private actors operate. With this adjusted welfare state typology, the position of the social rented sector is structured more precisely (Boelhouwer, Hoekstra 2012).

Notwithstanding the economic, social, and political differences within South Asia, a large proportion of its urban poor tend to live in settlements deemed illegal, lack access to water and sanitation, are often threatened with eviction, derive precarious livelihoods from the informal economy, and struggle to access low-cost institutional credit. Housing policy has and continues to ignore this reality. It remains obsessed with preventing the growth of squatter settlements, on the one hand, and seeking to promote owner-occupation, on the other hand. As the challenges accompanying urbanisation are set to intensify on several fronts, a more realistic and joined-up rethinking of housing policy is urgently needed. The ultimate challenge for governments in South Asia is to find political spaces for new housing policy directions commensurate with the specificity of their own development context (Kumar 2012).

Research on housing, neighborhoods, and health has been growing in the past several years, in part due to the interest in socioeconomic inequalities in health status observed in the affluent countries of the world. These inequalities are

believed to be the result of socioeconomic differences in the quality of everyday living conditions, and attributes of housing and neighborhood are significant components of such conditions. Because housing and neighborhoods are multi-attribute phenomena; however, it is necessary to identify those attributes of housing and neighborhoods that have an influence on health, to guide both policy and research in the future. Six key dimensions of housing that are plausibly related to health are identified (biological/chemical/and physical factors; physical design; psychological dimensions; social benefits; financial dimensions; and locational dimensions). The latter of these, locational dimensions of housing, provides a segue into a discussion of the roots of neighborhoods and health research, as well as the attributes of neighborhoods believed to be related to health (Dunn 2009).

Valença (2015) reviews recent developments regarding social housing policies in Hong Kong and the UK. Underlying the analysis is the fact that, during the last 40 years or so, both countries have been major global players in financial markets and thus pursued aggressive market-driven approaches to economic development. Notwithstanding that fact, each followed a different direction regarding housing policy reforms in the period. In Hong Kong (HK), the system of public housing provision was expanded; in the UK, the system of housing provision was scaled down. The argument being developed here is that a pro-public housing approach in HK should not be seen as a threat to capitalism in any way or measure. On the contrary, land development as well as land-originated fiscal revenues is a crucial part of HKSAR government's revenues. In the UK, this is no different. The return (through various forms of privatization) of the public housing stock (Council housing) to private hands (homeowners and housing associations) meant also to enhance businesses, in particular the mortgage and real estate markets. In both cases, there were also clear political reasons that justify developments in housing policy. The idea that Council housing served as a stage in the passage from a time when housing was predominantly provided in a largely unregulated private-rental market to a time when most people became homeowners is also discussed. This was what defined the 'modernization' of housing in the UK. The of 'residualization' was adopted to discuss the UK case. One important question is to know whether Hong Kong will follow the same path of 'modernization' as the UK, in the future. So far, HK has resisted; public housing has been 'resilient', ensured by a proper repair and maintenance policy, redevelopment and production of new housing throughout the last decades. Resilience is also granted by people's recognition and attachment to public housing and low stigmatization. More importantly, public provision of housing continues to be regarded, in both countries, as a necessary development to grant quality of life and a better distribution of income, avoiding the sharpening of social and territorial segregation, gentrification and stigmatization (Valença 2015).

Since the housing market reform in 1998, China has experienced a rapid growth. Continuous surges in housing prices have been criticized by the public. In light of deviation of the price from its intrinsic value, the central government implements a series of policies to intervene the housing market, but makes little difference. Little vigorous academic work on the price anomaly and impact of macro-control measures has been conducted for housing markets in urban China (Hui, Wang 2014). Hui and Wang (2014) research employs econometric methodologies to investigate the interactions between housing price and market fundamentals, in order to identify the existence of price anomaly in the housing markets of Beijing and Shanghai during 1998–2012. In addition, Hui and Wang (2014) conduct asymmetry analysis based on an advanced econometric model to investigate the impact of macro-control measures on price and volume. Hui and Wang (2014) findings suggest that the market inefficiency is indicated by lack of interaction between housing supply and demand in Beijing and Shanghai. The opposite directions of impulse responses of price to income in the two cities are mainly attributed to the different market structures. While price anomalies are found occasionally, the housing prices are considered reasonable in Beijing and Shanghai for most of the time. Furthermore, the analysis on the role of macro-control policies in Chinese housing markets reveals that government interventions regulate the market ineffectively at the current stage (Hui, Wang 2014).

Nigeria's housing problems have persisted regardless of changes in policy, strategies, actions and instruments (Daniel, Hunt 2014). Daniel and Hunt (2014) examine housing policy changes and factors that influence housing supply outcomes at the local level. Daniel and Hunt (2014) review the state of housing provision in the national context. The focus is then turned to the city of Jos in north-central Nigeria, where institutional arrangements for the provision of housing are critically examined. Primary data was obtained through interviews with industry role players (government officers and house builders) and the views of people were sampled through a questionnaire survey. This data was then combined with secondary source material to examine financial mechanisms, subsidy provision and local-level organisational frameworks for partnership. The findings suggest that a shift from a state-led to an enabling approach for housing did stimulate the activities of private house-builders and primary mortgage institutions. However, their activities are not spread across the regions of Nigeria. The issue of equitable allocation of public housing across the regions of Nigeria by the federal agencies has not been addressed by the enabling policy framework. Further, the idea of decentralisation of housing provision was introduced but did not result in the formulation of strategies by the local authorities in Jos. The national housing policy itself appears to be ambiguous and difficult to implement by the authorities in Jos. The ambiguities arose because there is a lack of policy enforcement mechanism, political commitment, and a poor local

organisation and coordination framework. These failures create uncertainties and risks for private house builders that partnered the government to access finance and subsidies for the provision of low-income housing in Jos. Also, there is limited participation of households due to lack of awareness on public policies (Daniel, Hunt 2014). On the basis of Daniel and Hunt (2014) findings, some policy recommendations are made.

Spatial work-residence mismatch and poverty concentration are two important problems faced by many metropolitan residents. Governments usually develop new towns and supply public housing to solve these problems. The new findings indicate that such joint effects really do exist. The Job opportunity effect in inner city regions would have greater influence on its residents' work-residence matching than the public housing lock-up effect. Public housing residents in developing new towns have difficulties finding jobs in nearby areas, and that poorer people appear to cluster in these areas as private renters. These new findings would provide valuable implications for future policy making (Hui *et al.* 2015).

Governments throughout the world intervene heavily in housing markets, and most have multiple policies to pursue multiple goals (Olsen, Zabel 2015). Olsen and Zabel (2015) analyse two of the largest types of housing policies in the United States, namely, low-income rental assistance and policies to promote homeownership through interventions in mortgage markets. Olsen and Zabel (2015) describe the rationales for the policies, the nature of the largest programs involved, the empirical evidence on their effects, and the data and methods used to obtain them. Because the US government uses such a wide range of policies of these types, this evidence has lessons for housing policy in other countries (Olsen, Zabel 2015).

A change to a zero emission housing future requires significant innovation in both policy and practice, as described by socio-technical transitions theory (Moore *et al.* 2014). Moore *et al.* (2014) examine emerging policies towards zero emission housing standards from the EU, UK, USA, California and Australia to determine alignment with socio-technical transitions criteria. This analysis is then positioned within the Australian context, which is characterised by a lack of policy innovation. The limitations of existing regulatory approaches are identified. The analysis finds that a number of key socio-technical transitions elements are addressed in the case studies, but there are also elements that are absent or inadequately dealt with. Five key transitions elements are identified as being developed only to a limited extent in the Australian context, namely long-term goals, pathways, links to wider policies, financial innovation, and the inclusion of wider social elements. Consideration of these elements in future minimum energy performance standards could facilitate a transition to zero emission housing (Moore *et al.* 2014).

Achieving sustainable urban development (SUD) remains one of the most important goals for many countries. Numerous nations have made attempts to attain sustainable development (SD) by fixing one or more of the problems facing urban development, which has resulted in various approaches to SUD. However, a main issue that could help decision-makers deal effectively with SD needs to be emphasized (Hassan, Lee 2015). Hassan and Lee (2015) study covers 10 topics that have recently become highly relevant to SUD: (1) A balanced approach to SUD, (2) Socio-cultural awareness, (3) Urban sprawl, (4) Economic urban development, (5) Transportation, (6) Urban renewal, (7) Mitigating greenhouse gases (GHG), (8) Urban vegetation, (9) Assessment systems, and (10) City structure and land use. The methodology is based on an overview of these themes via a critical reading of different publications, mostly from the last five years. Hassan and Lee (2015) classify these topics both quantitatively and qualitatively in order to highlight hot-button issues at the domestic and international levels. The publications that were analyzed showed that Asian countries, especially China, are making changes towards SUD more than nations of other continents. Hassan and Lee (2015) conclude that transportation is the most prominent challenge in the field of SUD, followed by socio-cultural awareness.

In developing countries, the prime actors in the shelter delivery processes are the households themselves. Massive numbers of people practice incremental self-help housing because other options are out of their reach. Official strategies to support the self-help efforts of the poor have developed since the 1970s through small-scale sites-and-services schemes combined with some form of assistance for self-builders. In many developing countries, the main housing practice has been through self-help, strongly propelled by massive rural to urban migration. Since the 1980s, international research and policy agendas focused more and more on a broadened habitat approach and attention for self-managed house construction gradually declined. Yet, self-help housing is still a widespread phenomenon, although mostly unattended or even ignored by governments (Bredenoord and Lindert 2010). Bredenoord and Lindert (2010) stress the importance of self-help housing and makes a plea for a revaluation of 'assisted self-help' as part of national and local housing policies. In view of the urgency of the urban housing question, new pro-poor housing policies are to be developed that actively support self-build initiatives. Assisted self-help housing has to be put central on the urban development agenda (Bredenoord, Lindert 2010).

Tenure choice presupposes not just the formal existence of various legal housing options, but also a minimum stock in each housing tenure category to ensure the accessibility of alternatives. In most post-socialist states, the mass 'give-away' privatisation of public housing into the hands of sitting tenants ate away at public rental housing, so in the end it formed just a marginal share of the housing stock. Given state budget cuts, there was little construction of new

public (nonprofit, social) housing. Private rental housing emerged from nothing, and during the transition period never became a viable long-term alternative to owner-occupied housing. Although in some transition countries the supply of private rental flats grew so fast that this market segment was soon larger than the residual share of public rental stock, the poor level of tenure security for new tenancies in the market segment (relating to the contract term and rent review, and the fact that many of these rentals were transacted informally) made this housing tenure seem like a transitional and residual form of housing. The rental housing has also suffered from the fact that housing allowances had little effect on housing demand. Many countries introduced this measure only recently, and in others, where such programmes were adopted in the 1990s, housing allowances served rather as additional social support for low-income families living in rent controlled housing than as a real demand-side housing policy instrument that respects the market reality of new tenancies (Lux 2012).

Since most voters in transition countries became homeowners, public housing was residualised, and private rental housing did not emerge to sufficient size or did not gain the popularity, most governments turned their attention to supporting owner-occupied housing. While most socialist governments earlier had introduced explicit measures favouring public rental housing, most post-socialist governments also maintained a style of biased tenure policy, but this time favouring owner-occupied housing. This bias additionally influenced the freedom of tenure choice. The nature of this 'choice' was reformulated as a selection between different forms of owner-occupied housing and housing finance. Instead of a neutral choice between different types of housing tenure and a tenure-neutral public policy, in post-socialist countries there appeared a typically steep, socially constructed housing ladder (a hierarchy of tenures) and policy that explicitly favoured private homeownership. However, in the past 5 years several transition states, in Central Europe especially, have launched more diversified policies and introduced new programmes directed at ensuring wider housing choice in the future (Lux 2012).

Rent policies are fairly common in countries with a – public or private – social housing sector that targets low-income households. Although policies are necessary to keep rents from spiralling out of control, not all rent policies pursue the same aims nor do they operate through the same instrument (Priemus 2012). Priemus (2012) looks at the current practices, the options, and the positive and negative impacts of rent policies on social housing.

Housing products are subject to more risks than other manufacturing products (Zhang *et al.* 2013). Based on an empirical investigation, Zhang *et al.* 2(013) examine the policy risks existing in the process of developing housing products in China. The findings demonstrate that policy risks have a major impact on the development of housing products in China and with different levels of influences

at different development stages. A comprehensive impact degree (CID) model is introduced to analyze the major policy risks affecting business performance during the development process. The research findings provide a valuable reference to both housing developers and policy makers in the industry for adopting proper risk management strategies to mitigate the effects of the risks involved in the development of the Chinese housing market (Zhang *et al.* 2013).

The difficulties that lower-paid public sector employees are experiencing in accessing affordable housing in high-cost locations have provoked a policy debate in a number of countries, including the United Kingdom and the United States. The UK Government has responded by providing different forms of financial assistance to eligible workers through its Key Worker Living programme and national planning policies. The provision of equity loans and new rental developments targeted at key workers also exist in the United States. However, there remain some fundamental problems in pursuing key worker housing policies, not least in defining and drawing boundaries of key worker entitlement, measuring the causes and extent of the problem as well as evaluating policy effectiveness (Morrison 2012).

Though China has achieved great strides in improving housing provision, it is still plagued by a lack of affordable housing. Over the last two decades, China has launched several affordable housing programs to help low- and moderate-income households own or rent decent homes. However, critics argue that those programs increase housing inequality (Zou 2014). Zou (2014) analyzes the contradictions in China's affordable housing policy. Based on a comprehensive and critical assessment of the country's major affordable housing programs, Zou (2014) finds that the division of powers, incentives, responsibilities, and revenue sources between the central government and local governments has worked against the state's affordable housing goals. Zou (2014) research also examines the innovations that the government has introduced to improve affordable housing policies in recent years.

The recent history of planning policy in England leaves the treatment of housing supply in a confused position. Much depends on the analysis of evidence on the current and future need and demand for housing for groups of inter-related localities (Bramley and Watkins 2015). Arguably the most appropriate spatial scale of analysis of market adjustment processes is the functional urban sub-region, and Bramley and Watkins (2015) discuss the development and application of an economic market model at this level, applied to c. 100 functional housing market areas across England. This goes beyond most previous analyses of UK housing markets, which have lacked explicit treatment of land-use planning and the supply process, while also recognising the economic and supply influences on demographic change. Based mainly on short-medium panel datasets and some micro surveys, component models for migration, household formation, prices,

rents, and new construction are estimated and combined with simpler labour market and demographic accounting to build a simulation model which can explore the potential impacts of economic, demographic and planning policy scenarios. Through a range of examples applied to groupings of sub-regions, and two local case studies, Bramley and Watkins (2015) focus on the way housebuilding, demographics and markets adjust to local decisions and the implications of this 'outcome-oriented' approach for planning. The results confirm a wider literature in showing that planning restriction raises housing costs, but underlines that the effects are quite gradual, particularly given the rather partial response of new housebuilding itself to planning decisions. They also show the interdependence between nearby sub-regions, and the likely adverse effects of leaving decisions to the local level, as well as the somewhat mixed impact of different levels of economic growth (Bramley, Watkins 2015).

Yu and Lee (2010) examine the impact of housing policies and macroeconomic variables on housing price instability during the Roh, Mu Hyun Administration (2003–2008) in Korea. Although researchers have documented the role of macroeconomic variables on changes in housing prices, few have addressed the relationship between governmental housing stabilization policies and housing price fluctuations. Using a statistical method, this research focuses on whether policy initiatives taken by the Roh Administration to stabilize housing prices resulted in the expected outcome of a stabilized housing market (Yu, Lee 2010). Controlling for macroeconomic variables, Yu and Lee (2010) empirical analysis reveals that the housing price stability policies of the Roh Administration had no observable impact on the stabilization of the Korean housing market. Conventional macroeconomic variables – the money supply, corporate bond returns, and the number of permits for building construction and actual orders for building construction have a statistically significant association with housing price instability in Korea. Yu and Lee (2010) discuss policy implications resulting from the ineffectiveness of housing stability initiatives in the Roh Administration.

Battams and Baum (2010) uses data from a South Australian case study of a period of mental health reform (2000–2005) to answer the question of how different policy networks set agenda and implement policy to ensure that people with psychiatric disabilities have access to appropriate housing. Qualitative methods were used, including interviews ($n = 31$) and focus groups ($n = 8$) with non-government organisations (NGOs), consumers and carers and professionals from health, disability and housing sectors, and participant observation with South Australian NGOs ($n = 52$). These data were supported by a thematic analysis of national and State (i.e. South Australian) policies in mental health and housing sectors. The research indicated that, despite a number of 'intersectoral projects' and regional networks, the health and housing sectors were

essentially separate policy systems with little integration. It also concluded that the absence of strategic integration across sectors leads to inadequate housing for people with a psychiatric disability. Research participants considered the need for better collaboration secondary to the need for additional housing and support resources and political commitment to such resources. A number of barriers and enablers to policy agenda setting and collaboration were identified (Battams, Baum 2010). Battams and Baum (2010) conclude with a discussion of policy and policy processes which will support housing outcomes for people with psychiatric disability.

The housing dimension in Kolkata has been changing in recent years. Since 1991, the city has initiated housing reform that has taken many forms and manifestations characterized by the reduction in social allocation, cutbacks in public funding and promotion of a real estate culture in close partnership between the state and private actors. There has been increasing concern about the housing condition of the poor in the deserted slums and bustee settlements amidst the evident 'poor blindness' in housing and investment policies (Sengupta 2010). Against this background Sengupta (2010) discusses self-help housing in Kolkata. It seeks to answer a simple question – why the concept of self-help has not been recognised as a viable policy option for a city with widespread slums and bustee settlements by visiting the complex urban context of Kolkata set within the city's politics, poverty and policies. Sengupta (2010) concludes that there is a need to recognise the existing structural duality in the city and support self-help housing as a parallel housing approach.

An interesting question concerns how large-scale (mental) health services policy initiatives come into being, and the role of evidence within the decision-making process behind their origins (Macnaughton *et al.* 2013). Macnaughton *et al.* (2013) illustrates the process by which motivation to address homelessness, in the context of the upcoming 2010 Vancouver Olympics, was leveraged into a pan-Canadian project including sites in Vancouver, Winnipeg, Toronto, Montreal and Moncton, New Brunswick. The aim of the initiative was to implement and evaluate an intervention, Housing First, to provide housing and support to previously homeless people with mental illness. This qualitative case study was conducted between December 2009 and December 2010, employing grounded theory, and drawing on archival documents and interviews with 19 key informants involved in the conception of the project. Overall, the findings affirm that policy-making does not follow a rational, linear process of knowledge translation/exchange and implementation, whereby evidence-based "products" are brought forward to address objectively determined needs and then "placed into decision-making events. Instead, evidence-based policy making should be understood within the much more complex context of "policy entrepreneurship" (Kingdon 2003; Mintrom, Norman 2009) which entails taking advantage

of windows of opportunity, and helping to bring together the "streams" of problems, politics, and policy ideas (Macnaughton *et al.* 2013).

Policies to promote the environmental efficiency of housing are well established across the developed world. These typically draw upon both traditional standard-setting regulation and market-based approaches, and increasingly recognise the role of households through education and 'behaviour change' initiatives. Characterised by underpinning market rationalisation discourses, policies to date have overall failed to deliver significant reductions in energy demand. In recognition of this failure and of the urgent need to address climate change and energy scarcity, policy-makers have the opportunity to design new approaches to housing energy efficiency by drawing on available evidence concerning the shaping of energy-related household and housing industry practice (Horne 2012).

Air pollution problems in China are related to imperfect legislation and potential integration problems among legislation, plans, and policies from the perspective of legislation, planning, and policy-making (Feng, Liao 2015). The purpose of Feng and Liao (2015) research is to make the overall system for prevention and control of air pollution in China understood by a broader audience by providing an overview of the pertinent legislation, plans, and policies, since such a review has not been presented so far. At the beginning of this article, Feng and Liao (2015) clarify the key definitions of legislation, plan, and policy and establish a preliminary analytical framework for evaluating the integration of legislation, plans, and policies. Then Feng and Liao (2015) present a variety of pieces of legislation at national, local, and international levels, including the Constitution, national laws, national administrative regulations and departmental rules, and local regulations and rules that were selected because of their direct and close relation to the prevention and control of air pollution, especially particulate matter. Feng and Liao (2015) comment on challenges of defects within the legislation framework and integration problems among legislation, plans, and policies. Feng and Liao (2015) put forward some improvement measures to address the challenges: (1) stipulating special provisions for prevention and control of motor vehicle pollution, (2) empowering local environmental protection bureaus to enforce the air-pollutant-emission permit system, (3) improving the feasibility of the air-pollutant-emission trading system, (4) clarifying government responsibility and intensifying penalties, and (5) integrating relations among legislation, plans, and policies (Feng, Liao 2015).

When you first started out in the real estate business, everything was exciting and fun. There was always something new to learn, you loved your flexible schedule, and you were so focused on growing your career that you overlooked the long hours, the problematic clients, and the inherent stress that comes with every real estate transaction. Your work may start to seem repetitive, the

challenges of your job may become more apparent than the perks, and your enthusiasm to meet new clients and network with colleagues may fade. Sound familiar? If so, you could be on the road to burnout. Indeed, the constant demands of the real estate business can take a toll on your physical and emotional health, putting your career at risk. But by recognizing the signs of burnout, you can take steps right away to reduce your stress and reignite passion for your job. The American Psychological Association defines burnout as "a depletion of an individual's energetic resources at work." Psychologists have linked burnout to increased risk for a range of health problems, including cardiovascular disease. So how do you know if you're experiencing burnout? The Mayo Clinic, which is devoted to the diagnosis and treatment of virtually all complex illnesses, says these are some of the key signs (Sparta 2007):

- You find yourself being more cynical and sarcastic at work.
- You lack the energy to be consistently productive.
- You've become more irritable or less patient with coworkers and clients.
- You drag yourself into work and have trouble getting started once you arrive.
- You feel disillusioned about your job.
- You have a hard time laughing at yourself.

The other important emotional driver during house purchase is the family. Family is the real engine or driving force of Indian real estate market. Strong family ties play a pivotal role; even today, if a person is buying a house, he consults his full family before a final decision. An individual may zero in upon a property, but a final call happens only with consensus of family members. The stamp of approval of elders is seen as a must. Family often lends financial support, without any 'interest' and, at times, without any expectation of return of their money. How else would one imagine people at the beginning of their career in their early thirties buying homes in metros; bank loans notwithstanding, it cannot be without the support of their family. So whether it is parents, in-laws, siblings – all have a role to play in that home purchase (Realty Trens 2012).

Property investment can be hugely rewarding but, to the first time investor in particular, it can be beset with financial obstacles that may impact any potential gain. Indeed, recent research has listed the top stress for landlords of buy-to-let or rental properties as dealing with rent arrears. An article in Propertywire has reported on research gathered in 2014 which uncovered the top stresses for rental property investors. A study by the National Landlords Association (NLA) revealed that for 32 per-cent of those polled, the most stressful aspect of renting out property was dealing with rent arrears. Nearly a quarter said that 'tenants from hell' was their major concern, with property damage a big worry for nearly 20 per-cent and deposit disputes causing stress for 13 per-cent of buy-to-let landlords. Nevertheless, an industry expert has noted that the signs for 2015 are only positive, "with the rental market set to continue its growth", indicating

that void periods – or times where the property sits empty – which were noted by 4 per-cent of the landlords in the study as a major cause of stress, are set to diminish (Pierre & Vacances Center 2012).

Buying a home is a very emotional process, but if you allow those emotions to get the best of you, you may fall prey to a number of common home buyer mistakes. Since buying a home has many far-reaching implications – ranging from where you will live to how hard it will be to make ends meet – it's important to keep your emotions in check and make the most rational decision possible. There are eight common emotional mistakes that people make when buying a home (Fontinelle 2011):

- Mistake 1: Falling in love with a house you can't afford. Once you've fallen in love with a particular home, it's hard to go back. You start dreaming about how great your life would be if you had all the wonderful things it offered – the lovely, tree-lined streets, the jetted bathtub, the spacious kitchen with professional-grade appliances. However, if you can't or won't be able to afford that house, you're just hurting yourself by imagining yourself in it. To avoid the temptation to get in over your head financially, or the disappointment of feeling like you're settling for less than you deserve, it's best to only look at homes in your price range. Start your search at the low end of your price range – if what you find there satisfies you, there's no need to go higher. Remember, when you buy another $10,000 worth of house, you're not just paying an extra $10,000 – you're paying an extra $10,000 plus interest, which might come out to double that amount or more over the life of your loan. You may be better off putting that money toward another purpose.
- Mistake 2: Assuming there's nothing better out there. Unless you are a high-end buyer looking at custom homes, chances are that for any home you find that you like, there are quite a few others that are nearly identical to it. Most neighborhoods have multiple homes that are the same model. Further, most neighborhoods are full of homes that were all constructed by the same builder, so even if you can't find an identical model for sale, you can probably find a house with many of the same features. If you're considering a condo or townhouse, the odds are also in your favor. Even when you have a long list of must-haves, there are probably several homes out there that can meet your needs. If there are snags with the home you've decided you like – such as major repair issues, an inflexible asking price or a difficult possession date – consider moving on. Being open to keep looking will save you from making rash decisions you might regret later.
- Mistake 3: Being desperate. When you've been looking for a while and you're not seeing anything you like – or worse, you're getting outbid on the houses you do want – it's easy to get desperate to get into your new

house now. However, if you move into a house you'll end up hating, the transaction costs to get rid of it will be costly. You'll have to pay an agent's commission (up to 5–6% of the sale price) and you'll have to pay closing costs for the mortgage on your new house. You'll also deal with the hassle and expense of moving yet again. If you decide not to move but to try to make the best of what you have, remember that alterations and renovations are expensive, time-consuming and stressful. If you have time on your side, it's OK to wait until something that suits you comes along - as long as your demands are realistic for your budget, you are bound to find something you live with.

- Mistake 4: Overlooking important flaws. For any of the three above reasons, you might be tempted to ignore major problems with the house that will be difficult, expensive or impossible to change. Carefully consider your options before you make a commitment, and consider waiting until something better comes along. New houses come on the market every day.
- Mistake 5: Overestimating your handyman skills. Don't buy a fixer-upper that's more than you can handle in terms of time, money or ability. For example, if you think you can do the work yourself then realize you can't once you get started, any repairs or upgrades you were planning to make will probably cost twice as much once you factor in the labor – and that may not be in your budget. Not to mention the costs involved to fix anything you may have started and the fees to replace the materials you wasted. Honestly evaluate your abilities, your budget and how soon you need to move before purchasing a property that isn't move-in ready.
- Mistake 6: Rushing to put in an offer. In a hot market, it may be necessary to pull the trigger very quickly if you find a home you like. However, you have to balance the need to make a quick decision with the need to make sure the home will be right for you. Don't neglect important steps like making sure the neighborhood feels safe at night as well as during the day and investigating possible noise issues like a nearby train. Ideally, you'll be able to take at least a night to sleep on the decision. How well you sleep that night and how you feel about the home in the morning will tell you a lot about whether the decision you're about to make is the right one. Taking the time to consider the decision also gives you a chance to research how much the property is really worth and offer an appropriate price.
- Mistake 7: Dragging your feet. It's a tough balancing act to make sure you make a careful decision, but don't take too long to make it. Losing out on a property that you were almost ready to make an offer on because someone beat you to it can be heartbreaking. It can also have economic consequences. Let's say you are self-employed. Perhaps for you more than anyone else, time is money. The more time and energy you have to take

out of your normal activities to search for a house, the less time and energy you have available to work. Not dragging out the homebuying process unnecessarily may be the best thing for your business, and the continued success of your business will be essential to paying the mortgage. If you don't pull the trigger quickly, someone else might, and you'll have to keep looking. Don't underestimate how time-consuming and routine-disrupting house shopping can be.

- Mistake 8: Offering too much. If there's a lot of competition in your market and you find a place you really like, it's all too easy to get sucked into a bidding war - or to try to preempt a bidding war by offering a high price in the first place. There are a couple of potential problems with this. First, if the house doesn't appraise at or above the amount of your offer, the bank won't give you the loan unless the seller reduces the price or you pay cash for the difference. If this happens, the shortfall on your bid as opposed to your mortgage will have to be paid out of pocket. Second, when you go to sell the house, if market conditions are similar to or worse than they were when you purchased, you may find yourself upside down on the mortgage and unable to sell. Make sure the purchase price for the home you buy is reasonable for both the house and the location by examining comparable sales and getting your agent's opinion before making an offer.

Panic, regret, frustration, fear. As real estate practitioners, we get to witness it all. Here's how to keep your clients' emotions (and your own) under control:

- Expect emotions. The first step to handling emotions properly is to fully expect them from your clients. As real estate agents (especially those of us who focus on residential real estate), we deal with people during one of the most stressful times in their life.
- Know the triggers. Try to understand why your clients feel the way they do. There are a variety of reasons why clients could get upset, frustrated, and overwhelmed during a real estate transaction. Here are some triggers (this is just the tip of the iceberg):
  - Things are happening differently than they expected.
  - Feeling like they don't have control over the process.
  - Not fully understanding the process.
  - Not feeling respected (by spouse or real estate practitioner).
  - Too many options from which to choose.
  - Afraid to make commitment to buy a home.
  - Panic about making the wrong decision/not being able to find home in tight timeframe.
  - Not finding the "perfect" home they had envisioned.
  - Financial worries.
  - Lack of trust in real estate practitioner/mortgage broker/home inspector, etc.

- Make sure their expectations are in line. We can never eliminate all of the emotional responses that clients will have, and some clients will be more emotional than others. But there are actions we can take as their real estate agent to keep things on a more even keel. Perhaps the most important thing you can do is to make sure their expectations are realistic. Did they expect to find their dream home in three weeks, and it's already taken two months? Did they expect to find a great deal, only to discover homes in their favorite neighborhood are still too expensive? Did they expect more buyers to show up at their open house? During your initial conversations with clients, help them understand that they might have to make compromises. Ask them what their expectations are and help bring them closer to reality using market statistics, your knowledge of the community, and your personal experiences. This is your job, after all, and you are the expert.
- Help them remain in control. It's so unsettling to feel like a situation has spiraled out of your control, especially when it's something as important as purchasing or selling a home. Good communication can ensure this doesn't happen. Make sure your clients know what is going on every step of the way. At each phase of the process, clearly explain what they can expect, and what is expected of them. Keep them in the loop with phone calls, e-mails, or transaction management software (of course, be sure you're using their preferred method of communication).
- R-E-S-P-E-C-T. Aretha Franklin had it right when she said "All I need is a little respect." Imagine that all of your clients are singing that song to you everyday. Respect that your clients do not understand real estate jargon or even the most basic details of a standard transaction. In most cases, this is new to them. When we are feeling a little burned out, or dealing with demanding clients, it's even easier to fail to treat our clients with all of the respect they deserve. If you find yourself in this position, take a step back, take a day off, and take some time to breathe before you speak to your clients again.
- Don't overwhelm them. It's easy for our clients to get overwhelmed. There are so many details to worry about! And so many decisions to make! This is especially true for buyers. With over 100 houses in any given price range in most areas, and buyers thinking they need to see every house before they can purchase, it's easy to see how things can start crashing in on them. As agents, it's our job to help them get back in control. The cure for overwhelm is to get people out of the big picture and bring them in to working on a single piece of the puzzle at a time. Help them focus their search, and remind them of the progress that they've made.
- Make a "don't panic" rule. Oddly, panic is the easiest to handle of all the emotional triggers. Start by programming your clients not to panic in the

beginning of the transaction before anything has happened. Here's a strategy I use with first-time buyers: I tell them "You're not allowed to panic until I tell you it's time. I promise I will tell you when it's time, but until then you're not allowed, OK?" This gives them a chance to laugh and they always agree. By setting this rule up front, we accomplish two goals. We're telling them that we're in control and have everything handled, which builds trust; and we're giving ourselves something to refer back to that will break the cycle later when they start panicking. What do I mean by this? By setting up the Don't Panic rule at the start of the transaction, you can, when a person begins to panic, ask them "What's the rule?" This causes them to stop thinking about whatever it is that they're panicking about and start trying to remember what the rule was. When it looks like they have changed their focus sufficiently, you can remind them that the rule was that they weren't allowed panic until you told them to. This gives them a chance to laugh at themselves while still breaking the cycle of panic.

- Give them a reason to trust you. When a client decides to hire you, they've decided to trust you. You've already put their trust in place, but you have to maintain it. If you follow the rules above, you are 90 percent on the way to keeping your clients happy. The other 10 percent is simply this: Keep your word; don't promise what you can't deliver.
- Don't take it personally, yet take responsibility. Nothing can protect you from all emotional outbursts. Some clients are dealing with issues they have not shared with us but which cause them to behave emotionally. Some need more attention than others. The best we can do is to have compassion and to stay grounded, centered, and calm in the face of whatever they may throw at us. When emotions do fly, don't take it personal, because rarely it is personal (even if it seems like it is). When anything goes wrong in a transaction, we are the easiest person to blame because we are there. But don't try to pass the blame. Just as you hate it when a server at a restaurant blames the kitchen for poor service, clients don't want to hear excuses. Make it your job to keep the transaction running as smoothly as possible and prepare clients for delays from lenders, sellers, inspectors, appraisers, and other third parties. Your open communication with these third parties is required for smooth dealings.
- When You Need a Break, Take it! Bad days will happen. Clients will get mad. Emotions will fly. But on the flip side, you will see some wonderful emotions too. Buying a home often evokes tears of happiness and pride. Remember to cherish the good days and not feel too hurt about the bad days. You have your own emotions too, and dealing with intense transactions can be draining. It's important to take a break once in a while to recharge your batteries and get motivated for the next transaction. You

have to take care of yourself first, or you will have nothing left to offer your clients.

1.2. Models and methods for the analysis of real estate development

Many models and methods for the analysis of real estate development and their constituent parts have been developed worldwide:

- Medalen (2004) linear model in the real estate development process.
- Røsnes and Kristoffersen (2009), Miles (2007) linear models in the real estate development process.
- Iterative real estate project models (Olsson *et al.* 2015).
- Seven stages of real estate development model of real estate development process (Kohlhepp 2012).
- A new Keynesian dynamic stochastic general equilibrium model on China's housing market fluctuations (Wen, He 2015).
- A sub-regional model of housing markets in England (Bramley, Watkins 2015).
- Estimation of the energy performance certificate of a housing stock characterised via qualitative variables through a typology-based approach model (Florio, Teissier 2015).
- Mixed-methods evaluation of a short-term housing support program for homeless families (Meschede, Chaganti 2015).
- Method and model for early-warning and forecasting of real estate development (Huang *et al.* 2005).
- Model for optimization of construction contracting in housing development project (Ngowtanasuwan 2013).
- Model of conflict resolution (Wang *et al.* 2015).
- Risk evaluation model for real estate projects (Sun *et al.* 2008).
- Analogical regression method (a real estate appraisal system) (Kettani, Oral 2015).
- Mixed-method approach (downtown redevelopment) (Charney 2015).
- Normative process model (managing iterations in the modular real estate development process) (Eppinger *et al.* 2013).
- Modeling park development (BenDor *et al.* 2013).
- High-speed rail station on spatial variations in housing price based on the hedonic model (Geng *et al.* 2015).
- Public–private partnership models (Wang 2015).
- Micro-simulation model of housing market processes (Ettema 2011).
- Megaproject model and a new funding model (Bon 2015).
- Expanded business operations model to evaluate eco-smart corporate communities (Dean *et al.* 2014).

- New generation of integrated land-use models (Voigt, Troy 2008).
- Planning models (Carmona 2009).
- Quantitative model for office development (Tang *et al.* 2000).
- Conflict solving model to resolve different stakeholder demands in the port redevelopment (Park, Lim 2013).
- Risk analysis in the real property development process (Miles, Wurtzebach 1977).
- Corridor trace analysis method (Thekdi *et al.* 2015).
- Community-based research model (Heacock, Hollander 2011).
- Hybrid model (real estate market led land development strategies for regional economic corridors) (Mittal, Kashyap 2015).
- Small hydropower development model (Chen *et al.* 2013).
- Public–Private Partnership models (Cruz, Marques 2011).
- Real estate prices and business cycles in emerging economies (Minetti, Peng 2013).
- Comparative, historical, statistical methods and the method of enumeration (Geipele, Kauškale 2013).
- DSGE model (Ng 2015).
- Comparative, historical, statistical methods and the method of enumeration (Geipele, Kauškale 2013).
- Grey box model (Terés-Zubiaga *et al.* 2015).

The following is a short description of some of the models and methods for the analysis of real estate development that is provided.

Medalen (2004) linear model in the real estate development process includes: idea (concept, funds available, site, expertise, etc.); acquisition/search for building site (for those not having a site); feasibility studies, concept; estimates (continuous); strategic planning (internal process); contact with authorities; scope clarification; negotiations/signing of contracts; planning/regulation; design; marketing/sales; construction; finalization and management.

Røsnes and Kristoffersen (2009), Miles (2007) linear models in the real estate development process include: Ideas for development, search for site and negotiations of site; feasibility study, contact with authority and risk in planning; acquisition of site, company structure and financial constraints; status of regulation and planning; design, contract formation and marketing for sale; construction; finalization with formation of real estate.

Many models tend to assume, or at least visually present, the real estate development process as relatively linear. At the same time, research on project management highlight that many large projects tend to be developed in an iterative manner. Agile methods are designed to manage an iterative project process. The aim of agile methods is to be able to respond quickly to changing requirements without excessive rework. Agile software methods can be seen as

a reaction to plan-based or traditional methods, which typically are based on a rationalized, engineering-based approach in which it is assumed that problems are fully specifiable and that optimal and predictable solutions exist for every problem. Three key elements in agile methods are incremental delivery, embracing change and involving the customer. The software is developed in increments in an iterative process. The system requirements are expected to change, and the project implementation model should be able to accommodate these changes. Ability for adaptation is a key concept to increase the value of the project. Customers should be involved throughout the development process. Their role is to provide and prioritize new system requirements and to evaluate the iterations of the system. Validation with the stakeholders (usually via a product owner) is done early and often in agile methods. Common agile methods include Scrum and XP. Implementation in waves of complete features is a common practice in these methods. This usually allows more flexibility than traditional plan-driven approaches. The philosophy of not taking decisions until the last responsible moment related to lean construction, is also applicable to agile methods (Olsson *et al.* 2015).

Olsson *et al.* (2015) case studies indicate that it may be beneficial to describe the property development process in a more iterative manner than is typically the case in the literature. Olsson *et al.* (2015) have developed an agile model for real estate development projects. The different phases follow one another, but at the same time certain processes must be repeated more or less continuously throughout the entire real estate development in terms of loops – an iterative process. This dynamics is perhaps one of the most obvious features of real estate development process, and understanding this is crucial for success in the field. Olsson *et al.* (2015) illustrate the need for repeated analyzes and assessments of the various steps in the development process of the project. The repeating analyzes is a good illustration of the dynamical character of real estate development. There are often three main phases, but there are also iterations between or within phases. Three distinct phases can be identified in the property development process: Early phase, Regulation phase and Implementation. The early phase includes idea development, site search and feasibility studies. Regulation phase covers a wide range of dialogues with public authorities and business partners. Implementation includes detailed design, sales and construction. In addition, there are continuous supporting processes that are relevant during several phases, covering issues such as market analysis, strategic planning, portfolio assessment and estimates of property value (Olsson *et al.* 2015).

Seven Stages of Real Estate Development model of real estate development process considers the overall life-cycle of a real estate project. In each stage, the developer achieves certain tasks by spending money, using unique talents and skills, and in the process taking risks to increase the value of the property. In

each stage, the developer buys one thing and sells another. In each stage, the developer must answer the following questions: Can I do what's got to be done?, Do I have the necessary skills, resources, time, and team support?, Can I take the risk of failure?, Can I create real value? Following is a brief description of the seven sequential stages (Kohlhepp 2012):

- Stage 1: Land Banking Stage. The "Land Banker" acquires or holds undeveloped or "raw" that he believes will become attractive for future development through general and broad market trends or perhaps. Land bankers can be active in the pursuit of opportunistic "land buys". Although many land bankers can be advertent land owners such as estates or government agencies or public utilities. This is a relatively passive investment position. Good examples of "land bankers" are public utilities, universities, and inheritors of the "family farm." When the market conditions are right, the land banker then sells the land to a "land packager". The land banking stage and the redevelopment stage are really the same except that the land banker usually has "green fields" and the redeveloper has "brown fields."
- Stage 2: Land Packaging Stage. The "Land Packager" buys the raw land from the passive land banker and then improves the value of the land through conceptual land planning, zoning changes, financing schemes, or other "paper enhancements" like title insurance, accurate surveys, or environmental studies. Examples of land packagers are land planning firms, politically skilled lawyers, and governmental agencies who attempt to obtain government approvals of land they own. This "packaged land" is then sold to the "land developer".
- Stage 3: Land Development Stage. The "Land Developer" buys the land with the paper enhancements from the land packager and then improves the land so it can be sold as finished building pads to building developer. This usually involves the construction of horizontal infrastructure such as roads and utilities as well as common improvements such as water dentition and recreational facilities. A good example of the land developers are master-planned community developers who construct the roads, utilities, and recreational amenities and then sell building lots to home builders.
- Stage 4: Building Development Stage. The "Building Developer" buys the finished pad from the land developer and then does the vertical development by constructing the building improvements. During construction, the building developer may also attempt to lease the building so the finished building can be sold to the building operator. Home builders are a good example of building developers. On the commercial side, building developers are often called "merchant builders."
- Stage 5: Operating Stage. The "Building Operator" leases up the property, manages the property, and develops a building operating history so it can

be sold to other building operators during its economic life or sold to a building renovator at the end of its economic life. The biggest building operators are usually referred to as institutional investors which may include pension funds, insurance companies, or public real estate investment trusts.

- Stage 6: Renovation Stage. The "Property Renovator" buys the property with substantial economic and/or physical depreciation and creates value by curing these deficiencies then re-positioning and operating the building until the property is ready for redevelopment. The unique skills and risks for building renovators are usually found in companies that specialize in "historic renovation." Currently, many shopping center developers are looking for old centers that need to be fixed-up and re-marketed to different retail tenants.
- Stage 7: Redevelopment Stage. The "Property Re-developer" buys the property with such serious physical or functional deficiencies that the improvements must be torn down and/or re-developed for another use. This essentially begins the real estate development process all over again. In every major city, government-sponsored redevelopment agencies are probably the largest players in the stage even though they didn't exactly "buy" their holdings from building renovators. Usually the municipalities acquire the properties through tax foreclosures and assign them properties to the agencies to be sold.

It is important to note that in each stage, tasks are completed, capital is committed, risks are taken, and value is created. Most individual developers do not have the skills or capital to do all the phases. Large development companies may have many different skills and product types, but usually there is a core set of competencies that have enabled them to become large real estate developers. However, there is a strong attraction to taking additional risks to capture additional returns, so we see home builders becoming land developers and land developers becoming land packagers without critically analyzing the new risks and competencies that are required. Also we see building operators, intentionally and sometimes unintentionally, becoming building developers (Kohlhepp 2012).

The tasks that need to be accomplished in each above stage of development can be divided into eight major categories. The categories may overlap, and the distinctions may be fuzzy and blurred. However, it is important to note that each stage begins with the acquisition tasks and ends with the disposition tasks. The other tasks are not done in any particular order and many are done simultaneously. The categories are (Kohlhepp 2012):

- *Acquisition*. Each stage of development begins with the Acquisition Tasks. The developer must determine if the subject property (or land parcel) provides an opportunity to create value by completing the required tasks and then "selling" the property to the next stage of development. The developer

must determine if he has the abilities, resources, and temperament (physical, human, and financial) to assemble a team to accomplish the required tasks as well as the wherewithal to bear the risks associated with these tasks. Often the Acquisition Tasks are broken down into four categories: feasibility studies, underwriting requirements, contract negotiations, and closing conditions.

- *Financing*. The financing tasks require the developer to determine the amount and type of capital required to fund the initial acquisition, the interim holding costs, the completion of the required tasks, and eventual disposition of the development. The developer then must determine the most efficient method to raise the required capital and then actually raise the capital. The financing tasks can be divided into three categories: financial projections, financial management and projections, and capital formation and accumulation.
- *Market Studies and Strategies*. The marketing tasks require the developer to determine what are the current and future market conditions for the expected end-uses(ers) of the property. The developer then must determine the most appropriate marketing strategy given the current and future market conditions. In implementing the marketing strategy, the developer must determine the appropriate marketing mix. The marketing tasks can be broken down into three categories: projected economic conditions, market strategy, and advertising and promotion (the marketing mix).
- *Environmental Tasks*. The developer must determine how the past, present and future environmental conditions of the site and surrounding areas affect the development of this particular site and set of uses. In doing so, the developer must consider how the atmospheric, surface, and subsurface conditions affect the development of the site. Also the developer must determine what effect the historic and cultural traditions of the site and surrounding area may affect the development of the site? Finally the developer must determine if an Environmental Impact Study required. Given these consideration and determinations, the developer must resolve, remediate, or accommodate them in a timely and cost effective manner. These environmental consideration and tasks can be broken down as follows: Environmental Studies, LEED Ratings, Atmospheric, surface and sub-surface conditions; Cultural and historic conditions.
- *Approvals and Permits*. In every stage that there are the required approvals and permits needed to operate, improve, or modify the property during the development. The developer must not only determine what approvals and permits are necessary, but he must also acquire these approvals and permits in a timely and cost effective manner. The approvals may be at the federal, state or municipal level and they also may be from regional authorities or

private individuals or organizations.

- *Improvements*. The "improvement" tasks require the developer to determine what improvements (public or private; horizontal or vertical) need to be planned, designed, engineered, and construction. With that determination, the developer must be able to plan, design, engineer and or construct these improvements in a timely, efficient and cost-effective manner.
- *Transportation/Accessibility*. The transportation and accessibility tasks require the developer to determine not only what transportation systems (public and private) the space users (tenants, customers, suppliers) will use to get to the property, but also to determine how tenants, customers, and suppliers will get around the site once they have reached it. In some cases these off-site transportation systems, and in all cases the on-site accessibility systems, must be designed, engineered, and constructed.
- *Sales and Disposition*. The sales and disposition tasks require the developer to complete the seller's due diligence, to market the property for sale, to negotiate and execute a sales contract, and finally, to negotiate any necessary development agreements. The developer may decide not to sell the property at this stage and continue on to the next stage of development. In this case, the disposition exercise is then blended into the acquisition tasks for the subsequent stage of development.

Major real-estate developers of business parks around the world have made environmental responsibility a priority in building design, construction, and operation. We review the green real-estate development movement occurring globally, and synthesize applicable concepts into a framework called the expanded business operations model (EBOM) to help companies gauge their goal of environmental stewardship. In contrast to the typical flow diagram of a typical business operations model, the EBOM indicates cycling behavior that synergistically enhances each of the four identified categories – Environment, Facilities, Business Synergism, and Green Image. The ultimate goal of these Eco-smart Corporate Communities is to positively impact the local and larger community, while increasing the economic success of property developers and their tenants. We review governmental policies that drive developers toward environmentally friendly techniques, outline tools and programs that assist in the implementation and evaluation of green design plans, and summarize other drivers (i.e., environmental and social issues) that encourage green building and synthesize them into an indicator system for practitioners' reference. Using four independently operated eco-smart corporate communities as case studies, we identify the measures taken to enhance each of the four categories within the framework, and analyze the cascade of impacts. With this framework, it will be possible to set achievable goals that mark reasonable progress in corporate environmental policies (Dean *et al.* 2014).

Huang *et al.* (2005) present a pre-warning system developed to monitor and

provide pre-warning to the governmental decision makers in the Shenzhen property market. Huang *et al.* (2005) analyse essential factors affecting the Shenzhen real estate market. A set of factors are selected and a statistical early-warning method, which can monitor the Shenzhen real estate property market, is developed. In addition, a system dynamics model has been developed, which can provide a simulation tool to predict the effect of regulatory policies on the real estate market. Evaluation results indicate that the pre-warning system can provide useful information to regulate the property market in Shenzhen (Huang *et al.* 2005).

Ngowtanasuwan (2013) presented a method for solving a construction planning problem in a housing development project using a mathematical model which is an integer linear programming for dividing house construction jobs to three contractors in a project case study. 169 units of the house in the project would be constructed by the three contractors in conventional construction method and precast method. The results found application of the mathematical model was applicable. The mathematical models were formulated, minimum construction cost of the project was 417.69 million baht (M$13.92), and within the total project duration of 72 months (Ngowtanasuwan 2013).

Wang *et al.* (2015) proposes a risky project negotiation framework, comprising fuzzy real options, ordered weighted averaging (OWA), and the graph model of conflict resolution (GMCR). Fuzzy real options analysis is employed to evaluate risky projects where the value of managerial flexibility cannot be overlooked. For civil engineering project evaluation, OWA is used to estimate the parameters of the fuzzy real options model, such as initial values and volatilities, to reflect the risk preference of decision makers (DMs). Because it can take into account DMs' values and preferences for a risky project, GMCR is utilized to identify equilibria, or potential resolutions of the conflict, among all possible states, or combinations of DMs' choices. While an option pricing model is employed to estimate the values of decision makers (DMs) toward a risky project, all parts are integrated via fuzzy functions in this framework. A brownfield redevelopment case, the Ralgreen Community in Kitchener, Ontario, Canada, is used as a typical risky project to demonstrate how to apply this integrated approach (Wang *et al.* 2015). The main contribution of Wang *et al.* (2015) research is to demonstrate the comprehensive use of fuzzy methods to assess brownfield projects. For this purpose, stochastic methods face difficulties because risks cannot be fully reflected in market prices. Expert knowledge that is descriptive, multi-attribute, or subjective in nature can be effectively quantified using fuzzy representations (Wang *et al.* 2015).

With the rapid development of residential real estate market, risk evaluation has been an important task in the process of project (Sun *et al.* 2008). Sun *et al.* (2008) describe a risk evaluation method for residential real estate projects

based on fuzzy set theory which uses linguistic variables and respective fuzzy numbers to evaluate the factors. The primary weights of factors and evaluation of alternatives are determined by applying linguistic variables and fuzzy numbers. The notion of Shapley value is used to determine the global value of each factor in accomplishing the overall objective of the risk evaluation process, so the primary weights are revised, thus the importance of factors can be reflected more precisely. A major advantage of the method is that it allows experts and engineers to express their opinions on project risk evaluation in linguistic variables rather than crisp values. An illustration is presented to demonstrate the application of the method in risk evaluation. The results are consistent with the results calculated by conventional risk evaluation method. The research demonstrates that the method is objective and accurate, and is of an application value in the risk evaluation for residential real estate project (Sun *et al.* 2008).

Real estate appraisal is of great importance to several socio-economic stakeholders for different reasons and justifications: local governments and municipalities for taxation purposes; banks for mortgage and other credit applications processing; property valuation companies for marketing activities; and property developers and investors for sound investment decision-making (Kettani, Oral 2015). Kettani and Oral (2015) summarize the real estate appraisal system that has been developed for and with CUQ (Coomunaité urbaine de Québec), CUM (Communaité urbaine de Montréal), and Communaité urbaine de Gatineau (CUG) and implemented over the last twenty years in the Province of Québec. The salient features of the property appraisal system are: (1) property-specific individual appraisal using a new regression method called "analogical regression", (2) mass-appraisal based on property-specific individual appraisals, and (3) the size of real estate coverage (over 1,050,000 properties) and the variety of real estate profiles considered (shopping centers, office buildings, residential properties, farms, industrial units, etc.) (Kettani, Oral 2015).

Charney (2015) examines the attempts that planners have made to discipline downtown development through the articulation and implementation of land-use regulation. Such a mission is a definite challenge since planning regulation in this quintessential corporate complex is responsive and subordinate to marketplace dynamics. Drawing on the case of the old central business district in Tel Aviv and employing a mixed-method approach, Charney (2015) explores twenty years (1992–2012) of landuse regulation in which the initial strategy of office development has yielded to residential development challenging the predominance of the corporate-complex strategy. Planners in Tel Aviv have been closely involved in configuring redevelopment efforts, ascertaining that planning policies are not necessarily tailored to satisfy the interests of the development industry and that planners are not merely submissive agents. Instead, their actions may be viewed as a medium through which market forces are channelled and

disciplined. In the case of the downtown, planners mediated between market pressures for residential development and city-planning objectives that concern the long-term supply of land for office development in order to preserve the competitive position of the CBD. By setting reasonable and flexible objectives and taking advantage of administrative tools while concurrently listening to the market, planning authorities can, to a certain extent, counteract unwanted development pressures (Charney 2015).

Real estate development (RED) is a dynamic business with long-duration projects involving multiple parties with both common and sometimes conflicting goals. With large capital budgets in RED projects, time management is a primary factor determining success or failure. In recent years, Modular Construction Methods (MCM) have been successfully used to accelerate the construction of both residential and commercial RED projects. However, MCM requires higher levels of involvement from many parties earlier in the design and engineering stages of the RED process (Eppinger *et al.* 2013). Eppinger *et al.* (2013) explore the interdependent relationships among the tasks involved in MCM RED projects. Using Design Structure Matrix (DSM) analysis, Eppinger *et al.* (2013) have identified the planned and unplanned iterations in the development process which reflect rework of tasks that inherently require it and feedback loops that occur because of unanticipated problems. In a typical large residential RED project, Eppinger *et al.* (2013) have created both a normative process model and an improved one employing solutions to avoid the unplanned iterations in the original process which would result in costly setbacks. In doing so, Eppinger *et al.* (2013) have identified best practices from MCM processes that can help enhance traditional RED processes.

Provision of recreational open space is a major factor in determining resident quality of life in cities. However, urban growth and land use change models typically omit park location and allocation issues when simulating changing urban environments (BenDor *et al.* 2013). BenDor *et al.* (2013) introduce a method for exploring the spatial allocation of urban parks (public, recreational open spaces) given differing municipal and county investment decisions. Park planning literature has established level of service metrics as rough indicators of provision of public park amenities that are useful guides for future park investment decisions within a given jurisdiction. In this study, BenDor *et al.* (2013) create a dynamic-demand location model that simulates political feedback from population growth and LOS metrics to allocate new parklands ($\sim$0.5 ha $\leq$ neighborhood parks $\leq \sim$4 ha) in multi-jurisdictional urbanizing regions. BenDor *et al.* (2013) frame parks as a new development type that augments residential development currently driving a version of the Regional Urban Growth (RUG) urban simulation model, an open source, raster-based simulation platform. BenDor *et al.* (2013) approach allows planners and researchers to explore urban patterns and

distributive outcomes associated with different local open space requirements and investment choices. BenDor *et al.* (2013) illustrate this approach under scenarios for the rapidly growing, three-county Raleigh–Durham–Chapel Hill region of North Carolina, USA. BenDor *et al.* (2013) test varying delays in park planning, purchase, and construction, varying maximum park sizes, and the effects of increased investment levels in two jurisdictions within the study area. This model suggests that the most important aspect of successful park planning is the length of the lag time between residential and park development. Perhaps the most successful park planning strategy is to plan parks along with residential areas (BenDor *et al.* 2013).

High-speed rail is a large-scale form of public infrastructure that delivers obvious public benefits and economic externalities. The effects of high-speed rail on housing prices are significant, generating positive effects such as increased accessibility between cities as well as negative impacts such as noise pollution. The development of housing projects and urban spaces that surround high-speed rail stations can be improved by scientifically examining the effects of high-speed rail stations on housing prices (Geng *et al.* 2015). In examining the Beijing high-speed rail station, Geng *et al.* (2015) develop a hedonic model to study the effects of a high-speed rail station on housing prices at varying geographical spatial ranges. Research shows that greater accessibility between cities, increased investment attractiveness, and an expansion of public service infrastructure results from the establishment of high-speed rail stations, which in turn positively affects housing prices. However, traffic congestion, electromagnetic radiation pollution, noise, and higher crime rates negatively affect housing prices. Spatial variations in housing prices result from the combined effects of positive and negative impacts. From the research result that housing price increases with an decline in distance between houses and high-speed rail stations within (0.891 km, 11.704 km) by the influence of high-speed rail station, and thus Geng *et al.* (2015) recommend that residential land-transferring fee premiums resulting from high-speed rail station construction should be dedicated to the construction of affordable housing. In addition, housing price declines with an decline in distance between houses and high-speed rail stations within (0.475 km, 0.891 km), and thus regarding negative impacts of high-speed rail stations on housing prices, Geng *et al.* (2015) recommend that compensation be made available to homeowners residing in affected regions. While land use intensities and urban space layouts should be considered during the planning of high-speed rail stations (Geng *et al.* 2015).

Over the past few decades public-private partnership (PPP) models adopted by governments for infrastructure development throughout the world have evolved continuously. This article develops a dynamic framework which argues that PPP models evolve when some of the critical success factors (CSFs) for

PPP are changed/improved over time based on project sponsors' risk management. The framework consists of four elements: CSFs for PPP, rising risks due to poorly addressed CSFs, the corresponding risk management to change/improve the CSFs, and consequently changed PPP models. Here, CSFs for PPP contain three aspects: external environment, internal project characteristics, and partnership-related factors. The framework is empirically explored with a multiple-case analysis of six toll roads developed in the United States since the late 1980s. The results demonstrate a two-phase evolution of PPP models in the studied context, confirm the theoretical framework, and find that public institutions' risk management can effectively explain the PPP evolution (Wang 2015).

Ettema (2011) introduces an agent-based micro-simulation model of housing market processes. The model describes aggregate housing market developments, such as price and turnover, as the outcome of households' decisions to search for a new dwelling, accept an offered dwelling or sell their dwelling. An important feature of the model is that households' decisions are based on perceptions of housing market probabilities. Households update these perceptions based on observed bargaining outcomes in the market. The model was tested in a simulation experiment and appeared to respond plausibly to different market settings in terms of prices and households' perception of the market (Ettema 2011).

The practices and instruments of urban governance are rapidly changing in Delhi, a metropolitan area of 24 million inhabitants characterized by strong socio-economic inequalities (Bon 2015). The Delhi metro megaproject and its financing mechanism through land value capture are the prism through which Bon (2015) analyses governance patterns at different scales. This model has led to the production of mixed-use spaces in the heart of the city, allowing for a spatial cohabitation of transport functions as well as residential, commercial, and economic uses, following a pattern that has been identified as one of the defining features of a 'new generation of megaprojects'. It argues that although there has been significant institutional change, notably the entry of private sector actors in mega infrastructure development, careful analysis of the modalities of this mechanism reveal important aspects of continuity including the pre-eminence of techno-scientific planning, minimal stakeholder consultation and conflicts in the public sphere. The Delhi metro case will be situated within the larger Indian context, which has been marked since the 2000s by the emergence of city-centric growth strategies with public investments concentrated in large cities often in the form of public-private partnerships, and the importation and adaptation of international models (Bon 2015).

Since the late 1940s, the United States has experienced a decentralization of residential development. In the process, large areas of previously undeveloped lands are being converted to urban uses with consequences that are not yet fully understood. This geographic shift is the result of a number of socioeconomic

and ecological factors which influence individual decision making. Land-use modeling has emerged as a relevant tool for understanding the diverse drivers of urbanization, evolving from a spatial mathematical specifications of linear relationships to spatially explicit dynamic simulations that allow feedbacks between model subsystems and account for a divergent set of institutional and ecological forcings. Advances in computer hardware and software, including geographic information systems (GIS), increased digital data availability, and human understanding of natural and social system functions have enabled increasing sophistication of modeling applications and data integration. The narrowly focused models of the past are giving way to a new generation of integrated land-use models that include dynamic representations of the social, economic, and ecological subsystems and explore the interactions and feedbacks among them. Finally, land-use models are an effective way to facilitate stakeholder involvement in land-use planning through cooperative scenario development and policy analysis (Voigt, Troy 2008).

The story of the redevelopment of the Isle of Dogs in London's Docklands is one that has only partially been told. Most professional and academic interest in the area ceased following the property crash of the early 1990s, when the demise of Olympia & York, developers of Canary Wharf, seemed to bear out many contemporary critiques. Yet the market bounced back, and so did Canary Wharf, with increasingly profound impacts on the rest of the Island (Carmona 2009). Carmona (2009) takes an explicitly historical approach using contemporaneous professional critiques and more reflective academic accounts of the planning and development of the Isle of Dogs to examine whether (Carmona 2009) can now conclude that an urban renaissance has taken place in this part of London. An extensive review of the literature is supplemented with analysis of physical change on the ground and by analysis of the range of relevant plans and policy documents that have been produced to guide development over the 35-year period since the regeneration began (Carmona 2009).

Planning control decisions are often characterized as results of a complex deliberation process that involves consideration of many factors. This exploratory study uses logistic regression to investigate whether it is possible, based upon a small number of quantifiable variables, to correctly predict the past decisions on 162 planning applications for commercial-office development in urban Kowloon of Hong Kong (Tang *et al.* 2000). Tang *et al.* (2000) final quantitative model identifies four key factors that can explain up to 77% of the decisions, but none of these factors are included in the formal planning guidelines. Tang *et al.* (2000) suggest the need for further research into the local planning control decision making process, particularly in relation to the issues of certainty and flexibility, the relationship between planning and market, and interaction between policy and decision.

Park and Lim (2013) present a conflict solving model to resolve different

stakeholder demands in the port redevelopment of the Incheon Inner Port. The different interest groups involved in this current project in South Korea include the land owner of Incheon Port Authority (PA), governmental regulator of Ministry of Maritime and Fishery (MOMAF), private port interests, port labor, business interests and port neighborhood near target area in port. TOCs are in favor of new terminals to maintain their business, while the PA has concerns about the financial burden of creating replacement terminals. The model used for solving conflicts between TOC and PA is a multi-criteria one of BC (Benefit and Cost) ratio, Net Present Value and Internal Risk Return. The analysis provides a transparent explanation to all parties that there is not a viable financial solution for creating new berths. The results are also important contribution to the stakeholder engagement process with port labor, government, business interests and neighborhood community (Park, Lim 2013).

Real property development is an interdisciplinary field that produces interesting time-risk questions for the various participants. The conceptual framework of the process is a normative staging of activities and related decision points. The framework provides the theoretical foundation for the application of management science techniques to this complex environment. The computer simulation model is a straightforward quantification of the conceptual framework. The equations incorporated in the model are common to financial and appraisal literature with alterations designed to encompass the unique aspects of the real property development process. The model is a tool for use in the application of sensitivity analysis to development period decision making. At various decision points in the process the decision maker can evaluate alternative risk control techniques on a cost-benefit basis using the model (Miles, Wurtzebach 1977).

Prioritization of investments to protect safety and performance of multiregional transportation networks from adjacent land development is a key concern for infrastructure agencies, land developers, and other stakeholders. Despite ample literature describing relationships between transportation and land use, no evidence-based methods exist for monitoring corridor needs on a large scale. Risk analysis is essential to the preservation of system safety and capacity, including avoidance of costly retrofits, regret, and belated action (Thekdi *et al*. 2015). Thekdi *et al*. (2015) introduces the Corridor Trace Analysis (CTA) for prioritizing corridor segments that are vulnerable to adjacent land development. The method integrates several components: (i) estimation of likelihood of adjacent land development, using influence diagram and rule-based modeling, (ii) characterization of access point density using geospatial methods, and (iii) plural-model evaluation of corridors, monitoring indices of land development likelihood, access point densities, and traffic volumes. The results inform deployment of options that include closing access points, restricting development, and negotiation of agencies and developers. The CTA method is demonstrated

on a region encompassing 6000 centerline miles (about 10,000 km) of transportation corridors. The method will be of interest to managers investing in safety and performance of infrastructure systems, balancing safety, financial, and other criteria of concern for diverse stakeholders (Thekdi *et al*. 2015).

Responding to extant power imbalances in the typical redevelopment process, grounded theory is introduced to aid in recalibrating development suitability models to serve the interests of underrepresented communities resisting development (Heacock, Hollander 2011). Using a community-based research model, Heacock and Hollander (2011) report on testing the potential of grounded theory in a low-income, primarily Latino neighborhood of Chelsea, Massachusetts (USA). After 13 iterations and a ground-truthing exercise, the research resulted in a development suitability model that offers a useful heuristic for community leaders to view development likelihood – an innovation over the conventional development suitability model by directly incorporating community issues in the model calibration (Heacock, Hollander 2011).

The rapid population growth has outpaced the planning interventions in most large Indian cities resulting into unplanned, leapfrogged physical development and considerable transport challenges for intra-city and regional traffic. As an afterthought, these concerns have been addressed by formulation of spatial development strategies to guide rapid urban expansion creating planned real estate development opportunities, and to ease regional traffic movements (Mittal and Kashyap 2015). Mittal and Kashyap (2015) research is based on two unique case studies of regional transportation corridors developed in the fringe areas of rapidly growing mega cities – Kundli-Manesar-Palwal Global Corridor (KMPGC) in the national capital region of Delhi (16 million people and the largest city in India) and Sardar Patel Ring Road (SPRR) in the City of Ahmadabad, India (6 million people and the seventh largest city in India). Both the cases employed unique land development strategies to achieve the larger public purpose while creating planned land and real estate development opportunities. The KMPGC Delhi case employed compulsory purchase for reserving 325-foot wide right-of-way (ROW) and created multiple economic nodes as theme cities, strategically located along its 135 km (84 miles) corridor. While, the case of SPRR Ahmadabad employed land readjustment (LR) technique for reserving 76 km (47 miles) long and 200-foot wide ROW of a regional ring road. Using these two cases, Mittal and Kashyap (2015) explain both types of land development processes and the financing models involved in these cases, and compares benefits and constraints of compulsory purchase and LR technique, especially in context of regional level real estate and economic development opportunities via new real estate markets as spatial corridors and economic nodes. Mittal and Kashyap (2015) finally recommends a new hybrid model – a strategy for rapidly growing cities, where both models can be used in a hybrid form to achieve regional level public asset,

create real estate market opportunities in fast growing fringe areas and achieve a planned development.

The Government of China (GOC), in conjunction with the World Bank (WB) and the Global Environment Facility (GEF), has recently developed the China Renewable Energy Scale-up Programme (CRESP). The latter involves an analysis of the current state of renewable energy resources in China as well as the implementation of a renewable energy scale-up development based on pilot work. Using the Zhejiang Small Hydropower Programme financed by the WB as a real-world application case study, a comparison is made between the project management policies espoused in China and those of the WB, with management constraints being examined in detail. Owing to the need for certain modifications to current management techniques, a framework model of programme management is put forward, with the project management office (PMO) at its core, and staged implementation and multi-level management constituting its principal methods. In addition, this model of programme management meets the requirements concerning the policies and procedures stipulated by the WB, with other benefits including a reduction in terms of cost as well as in the duration of the construction of related subprojects. This is especially relevant if we take into consideration the sheer number of small hydropower plants and the diversity of their locations throughout China. This model should therefore be considered for promoting the scale-up development of small hydropower and other renewable energies in China, and its application may have a wider significance (Chen *et al.* 2013).

Following the liberalization wave in the airline sector, airports have been gradually taken out of the public sphere and open to the private initiative. This phenomenon is generally referred to as privatization, but not all the cases consist of, in fact, a full divestiture of assets. Although infrastructure management is undertaken by the private sector during a pre-defined period, usually 30 years or more, the property remains public or is transferred to the public domain after that period. This is a form of Public–Private Partnership (PPP) where two different models can be found: institutionalized PPP or a typical contractual regime, such as the concession arrangements. PPP options have been a "hot" topic over the last decade, but few studies can be found in the literature on the PPP projects development in airport systems, for example, as far as risk sharing is concerned (Cruz, Marques 2011). Cruz and Marques (2011) look at recent developments in airport "privatization", distinguishing privatizations from PPP arrangements, through a case study approach, and establishing a comparative analysis of different PPP models used for airport management.

Minetti and Peng (2013) investigate a small open economy with constraints in both the domestic and the international credit market. The informational opaqueness of the domestic market hinders foreign lenders' activity, so that

entrepreneurs face looser borrowing constraints vis-à-vis domestic financiers. However, limited capitalization constrains domestic lenders. Calibrating the model to data from Argentina, Minetti and Peng (2013) find that the interaction between lending and borrowing constraints is a channel through which real interest rate shocks generate fluctuations in output, real estate prices and consumption. External financial liberalization increases volatility and affects welfare more than domestic liberalization but also mitigates the destabilizing impact of domestic deregulation (Minetti, Peng 2013).

Geipele and Kauškale (2013) considered the main problems of real estate market cycle, the main interrelated economic aspects of the problem and their connection with real estate development. The research objective is to identify the main regularities of the influence of real estate market cycle on the development in Latvia, having paid special attention to economic aspects of the problem. In the research there have been used comparative, historical, statistical methods and the method of enumeration. On the basis of the conducted research Geipele and Kauškale (2013) have provided recommendations for decreasing risks of development and unbalanced market cycle that will facilitate more effective decision-making promoting stable long-term development of the economy as a whole.

Recently, a lot of housing and their constituent parts modelling research have been performed: multi-scale analysis of rural housing land transition under China's rapid urbanization (Li *et al.* 2015); safety and health factors influencing performance of malaysian low-cost housing: structural equation modeling approach (Ramli *et al.* 2014); housing decision of young generation in urban China (Wang, Otsuki 2015); housing choices of migrant workers in China (Tao *et al.* 2015); social rental housing in HK and the UK (Valença 2015); relative consumption of housing (Aronsson, Mannberg 2015); retail accessibility and proximity effects on housing prices in Seoul (Jang, Kang 2015); housing policy, work-residence mismatch and poverty concentration (Hui *et al.* 2015); allocation and misallocation of economic housing in Beijing (Liu, Wong 2015); insufficient land supply and housing shortage (Huang *et al.* 2015); exchange rate, capital controls and housing prices in Asia (Ohno, Shimizu 2015); liquidity risk and cross-sectional return in the housing market (Zheng *et al.* 2015); relationship between income and housing deprivation: a longitudinal analysis (Fusco 2015); family and housing instability: Longitudinal impact on adolescent emotional and behavioral well-being (Fowler *et al.* 2015); testing calendar effects on global securitized real estate markets by Shiryaev-Zhou index (Hui *et al.* 2015); correlation structure and dynamics of international real estate securities markets (Wang, Xie 2015); securitized real estate markets (Li *et al.* 2015); analysis of the local government deficit, land finance and real estate markets in China (Pan *et al.* 2015); intermediated investment management in private markets (Andonov *et al.* 2015); risk and credit change in Asian securitized real estate market (Hui *et al.* 2015); real

estate market in the Upper-silesian metropolitan area (Zuzańska-Żyśko 2014); How integrated are real estate markets with the world market? (Hatemi *et al.* 2014); structural change in housing submarkets in burgeoning real estate market (Ling, Hui 2013); real estate markets and the macroeconomy: a dynamic coherence framework (Bouchouicha, Ftiti 2012); forces of change shaping the future commercial real estate market in the Helsinki Metropolitan Area (Toivonen, Viitanen 2015); real estate prices and business cycles in emerging economies (Minetti, Peng 2013); analysis on organization integration system towards large and complex building projects-from life cycle perspective (Ma *et al.* 2013); combining life cycle costing and life cycle assessment for an analysis of a new residential district energy system design (Ristimäki *et al.* 2013).

For example, Toivonen and Viitanen (2015) analyzed the built environment as a part of society which is facing fast and constant changes occurring in the surrounding environment. This is a challenging situation for real estates because their character does not inherently support fast changes and constant development. Nevertheless there are many reasons why it is essential that also commercial real estates are able to answer to development goals set to them by different market actors. This can be achieved by analyzing forces of change affecting the market at this moment. Identifying the forces is important because they form the future real estate market and related land use. When market actors are aware of the forces appearing in their action environment, they are able to notice any new phenomena emerging and quickly adapt their actions and even steer the development to the desired direction. This competitive advantage can benefit both public and private sectors (Toivonen, Viitanen 2015). Toivonen and Viitanen (2015) present the different forces of change affecting the commercial real estate market in the Helsinki Metropolitan Area (HMA) in Finland. The forces of change are studied with a future research method called environmental scanning (ES). The identified forces form a complicated network with many interconnections. Different actors working with real estate and land use issues can benefit from this knowledge in far reaching planning over these issues. Actors are able to make better decisions and prepare themselves for the future, if familiar with the forces of change shaping future real estates and their land use. Because of the constant changes happening in the action environment, the need to foresee and evaluate future requirements and demand set to real estates will only increase in the future.

1.3. Real estate cycle, stages of real estate development and reasons property development projects fail

The first recorded pioneer of studying property cycles was Homer Hoyt (Hoyt 1970) in 100 Years of Real Estate Values.

It is widely recognised that property (along with other forms of investment) follows a predictable cycle. The property cycle has three recognised recurring phases of boom, slump, and recovery. The property cycle follows a predictable pattern as sure as night follows day. This pattern reveals three distinct phases being boom followed by slump followed by recovery before the next boom commences etc. The property cycle (unimpeded) will always follows this pattern so a boom cannot precede another boom without first experiencing a slump followed by a recovery before the next boom can arrive. The property cycle must have a "free market" where property ownership is attainable by citizens without, significant government restrictions on ownership or, any form of monopoly. The following is an overview only of some of the elements evident in each of the property cycles phases (Trass 2004, 2008):

- Boom. When the boom phase commences most people fail to believe the boom will last and think it is just a short term anomaly because they do not have the context of understanding the property cycle. What is observed during the boom phase includes: rents rise to levels which place significant financial pressure on tenants; the time it takes for a property to sell after being listed for sale reduces markedly; property prices rise; yields fall as prices rise proportionally more than rents rise; there are few mortgagee/ forced sales; property finance is easy to obtain and there are a number of new lending products making borrowing easier; people borrow against their increased house values and spend this money on consumer items (TVs, boats, holidays, cars, etc.); there are many property seminars competing for investor money; property is a hot topic in the media (initially there is much speculation about how price growth will continue, but later in the boom the media turns its attention to the reduced affordability of property); there is a lot of discussion about how this boom will never end i.e. "it is different this time" and expectations that there will be no subsequent slump phase.
- Slump. The Slump phase typically commences a lengthy period of time (often years) before most people realise the property market is in the Slump phase, as there is a delay between the shifting trends of the "Key Drivers" and the impacts that are evidenced in the property market. The slump is usually the longest phase in the property cycle. The longer and bigger the preceding boom, the longer and harder the subsequent slump is likely to be. In contrast to popular opinion property values do not necessarily fall during a slump, values may simply stall for a lengthy period. What is observed during the slump phase includes: Increased vacancies of rental properties; Reduced cash flow for investors; Property price growth stagnates and/or property values fall; The length of time to sell a property increases markedly; Increased number of mortgagee/forced sales; Property finance is more difficult to obtain; There is much "doom and gloom" about property values

being too high in the media; Many property investors experience lower cash flow and sell down their property portfolios to some degree, or completely.

- Recovery. The recovery phase is always much shorter than the slump or boom phases. What is observed during the recovery phase includes: increased rents and cash flows; the length of time to sell a property reduces; property prices begin to increase; much confusion in the media reigns about whether recent property value growth is sustainable; many potential property purchasers delay buying because they evidenced value falls or a slow market in the preceding slump; the cycle continues.

Although there are a distinct set of complementary steps that every property developer must follow in order to achieve the best possible outcome, the process is rarely completely linear. It is important for the developer to remain flexible and have the capacity to problem solve and think on their feet at all times, as at any point plans can go awry. While the process may vary slightly from project to project, in essence all property developments must go through the following stages (Devine 2011):

- *Pre-purchase*. Pre-purchase is a fairly obvious first step in the development process. As the name suggests, it involves seeking out a block of land or established house site that has sufficient potential to either refurbish the existing property, or obtain development approval to construct multiple dwellings. At this stage it is important to already have finance in place or at least have an understanding of borrowing capacity. Developer may also consider enlisting experts' help to ensure the project's viability. They can either be a development manager who can coordinate the entire process and team of industry professionals or individually; a solicitor, architect, surveyor, town planner and estate agent to give their honest assessment of end values and marketability of the completed product.
- *Concept stage*. Once thedeveloper've found a potential site, the next step is to come up with a concept. Also, the developer should carefully gauge the market demand in chosen area and undertake a detailed analysis of the neighbourhood character, as maintaining the traditional nature of an area is an important consideration for local council and their town planning requirements and regulations. It's also a good idea to consider any neighbours to a site and potential objections they might have to the project. Taking all these factors on board and attempting to address them before the developer get too far down the development process can save valuable time, frustration and money down the track. Finally, the developer need to put pen to paper and do some sketches of a proposed development allowing for setbacks, driveways, private open space (as required by council), garages and parking spaces and room for turning circles so that residents can drive out in a forward motion. By undertaking this exercise the developer will be

able to determine how many units and of what size can fit on the remaining land. Ultimately the final decision to buy or not to buy the proposed site will come down to the number crunching of a pre-purchase feasibility assessment.

- *Purchase*. Obviously, this stage involves buying the land at a price that will allow the developer to make the necessary commercial profit that deems the project viable.
- *Town planning or Development Approval Stage*. Architect will be required to draw up plans that fit in with the relevant state planning codes as well as the local council's development guidelines. These days, as a result of the increasing complexity of the development process and associated rules and regulations, a town planner is often involved at this stage. And a land surveyor is required to plot out the site dimensions, levels and important features (service pits, position of adjacent dwellings, etc). Then be prepared for a wait, as it may take up to 12 months before the developer actually get all important development approval permit – during which time the developer may have to negotiate changes with the council or with objectors.
- *Working drawing and documentation*. Once the developer have finally received the permit for the development to proceed, the developer have received only a local authority's approval. It's now time for an architect and engineer to document the working drawings. These will serve two main purposes. They will be part of a) the instructions to a builder on what to build, and b) the documentation submitted for a building permit or Construction Certificate. While the architect and engineers are completing their work, the developer can advance things by finalising the selection of fixtures and fittings, and working with the consultants to complete the specifications.
- *Pre-construction*. During the pre-construction stage the developer will be busy acquiring quotes from prospective builders and of course bank approval for the development loan. Developer will have to discuss with a broker or financier their documentation and process requirements – and co-ordinate the developer timing to meet them so when the developer are finalising the building contract developer have the confidence that finance will be available.
- *Construction*. Finally the developer get on site to build the project, paying the builder progressively at the completion of each stage using draw-downs from the developer bank loan. Although this stage can last anywhere between six and twelve months, depending on the size of the project, it's the most exciting aspect of the development. During construction the developer should be obtaining subdivision approval from the local council. Developer would have checked at the Concept Stage that this was permissible in terms of council policies.

- *Completion and Post Construction.* Upon completion a project is either leased or sold. This is usually when finalise the plan of subdivision and separate titles for each unit.

There are a number of similar typologies to describe the property development process (Harding 2011):

- Phase 1: Evaluation. The evaluation phase considers the marketplace and potential development opportunities therein. It also involves physical evaluation of the site/s and a feasibility study. This phase specifically involves: opportunity/site identification, market analysis, site investigation, feasibility study.
- Phase 2: Acquisition. The acquisition phase involves the gathering of resources, including experts, debt and equity finance to support the investment, acquiring planning permission via resource consent/s, and purchasing the site where applicable. This phase specifically involves: professional appointments, financing, planning application, site assembly/purchase.
- Phase 3: Procurement. The procurement phase involves defining the new building in response to the feasibility study (Phase 1), especially in response to the target marketplace. The price of construction is set, and contractors are hired and managed to deliver the construction process within the planned time and budget. This phase specifically involves: design, tendering/contracting, construction.
- Phase 4: Disposal. This phase is about convincing people to rent or buy the new/retrofitted property and making as much profit as possible. This phase specifically involves: promotion, letting, sale.

The steps involved in each phase are not necessarily sequential and the steps often overlap or repeat. For example, if a development is pre-sold, parts of phase 4 will occur with parts of phases 1 and 2. Regardless of the sequence of steps peculiar to a particular development, as the project progresses the developer is exposed to greater risk because flexibility is reduced and commitment is increased (Wilkinson & Reed, 2008).

The main actors in the property development process as outlined by Wilkinson and Reed (2008) are:

- Landowners;
- Developers;
- Public sector and government agencies;
- Planners;
- Financial institutions;
- Building contractors;
- Agents;
- The professional team (planning consultants, architects, engineers, project managers, solicitors, accountants);

- Objectors;
- Occupiers.

While the success or failure of a property development project is often influenced by market conditions, some projects will fail regardless of the market. A "failed' project can be described as a project that fails to meet the overall financial or development objectives set by the project's developer or stakeholders. Projects that fail to meet expectations often have similar contributing factors. These projects usually suffer and fail do to poor due diligence, project planning, financial/project management or operations oversight. Mistakes made in the initial phases of the property development process are compounded and usually impossible to overcome. For this reason the initial feasibility, assessment and planning stages are the most critical for overall project success; and also where most failure occurs. So, here are 10 reasons property development projects of all size often fail (Charleston 2012):

- *Failure to Understand the Market and Customer*. While there are many outstanding property developers who constantly review their product against market conditions and adjust, some do not. These developers are continuing to develop and build product with little or no engagement with their customer. As a result, developments lack amenities customers are seeking or incorporating components customers don't need or want. In addition, some property developers fail to anticipate potential changes in market conditions at the project planning stage, with significant adverse consequences.
- *Paying too Much Money for the Land Component*. With the exception of a number of specialized property development market segments, if the land component of a project exceeds 14% to 16% of the overall development budget, it is going to be very difficult to secure a reasonable project return on capital invested. On a percentage basis, an average residential development's cost allocation doesn't usually fluctuate that significantly.
- *Poor Project Feasibility, Risk Assessment and Financial Analysis*. A detailed and comprehensive project feasibility is essential. Adequate risk assessment is dependent on the feasibility having all development components and contingencies included. SWOT analysis is essential and all project weaknesses or challenges require a detailed mitigation strategy.
- *An Inadequate Project Brief*. A quality project brief provides the benchmark for all design and development decision making. The brief is a point of reference and outlines clear parameters for development consultants, architects, engineers, contractors, operations and management staff. In order to meet cost, design and operational objectives, a detailed project brief is required.
- *Failing To Consider Operational Issues*. Operational issues are often overlook or inadequately considered in the planning stages of a project. Considering

the life of a project and the potential operating and maintenance costs involved, these issues should be considered at project inception and addressed in design development. How a development will be managed and operated after completion should also be considered at feasibility. A significant management or operational change post design can have far reaching cost implications and put at risk a project's residential sales contracts and viability.

- *Project Size and Scale*. Large or very large residential and mixed-use development projects tend to magnify risk. These projects can be much more complicated to design and build. This is especially true if the project cannot be phased. It is not unusual for a large project to take 5 or more years to plan, secure approvals, design and build. Large projects with significant development programs have greater exposure to market fluctuations and real estate cycles.
- *Design & Contract Variations*. Project variations are perhaps the single largest contributor to project cost escalation post contract execution. Nothing consumes a project's bottom-line faster than a significant construction phase design change. Once a construction contract is signed, the variation and design changes should be kept to an absolute minimum. Only changes essential to project viability should be considered in construction phase of the development cycle. As noted above, comprehensive due diligence and a detailed project brief will help minimize variations.
- *A Poor Sales and Marketing Plan*. As with any good business plan, a comprehensive sales and marketing strategy that incorporates all components is key. All marketing channels appropriate for the project should be explored with a critical eye to cost. Thousands of dollars can be spent on ineffective collateral materials or poorly planned and executed marketing campaigns. Correct product pricing is also essential. The sales and marketing plan is a significant component of early project feasibility and risk assessment.
- *Inadequate Project Contingency*. No matter how well a project is planned and executed, unforeseen issues will arise in the development process. An inadequate project cost contingency will place undue pressure on a project's overall financial success.
- *A Lack of Focus and Engagement*. Project developments can spin out of control in days or even hours. Experienced and well qualified project and construction management expertise is essential. With projects fast-tracked to save both time and money, an on-going and detailed focus on all phases of the development process is required.

1.4. Life cycle model of real estate development

The area involving the development of real estate (hereafter RE) does not seem very complicated at first glance. However, this view changes once a detailed

analysis is undertaken on issues relevant to this area. It is possible to analyze one of the main areas of RE development as an example – *RE investments*. Many books have been published and other publications released in recent years about RE investments, and certain topics within this area have been repeating in a number of publications. Several characteristic topics relevant to RE investments that keep reappearing in literature can be named: investment goals, comfort zone, trends in RE values and development, location, land management regulations, investment choices (multi-unit residential buildings, hotels, office buildings, shopping centers, industrial buildings and others), micro-level investment analysis, macro-level RE investment issues (portfolio theory, institutional system and the like), assessing investment performance, managing the investment process, RE development, risk, assessment methods, evaluation models, RE transactions, purchasing methods, negotiations, possible forms of investment ownership (partnership, company ownership, syndicate, managing land asset office, limited responsibility partnership), financing methods (mortgages: second mortgage, variable interest rate mortgage loan, fixed interest rate mortgage loan, reverse mortgage loan, balloon mortgage loan, assumable mortgage loan, leveraged loan and creative financing methods), financing strategies (such as being in the right place at the right time and the like), tax benefit, foreclosure and others.

Real estate development is a constant rearrangement of the built environment in the effort to satisfy society's needs. Roads, water and sewerage supply systems, houses, schools, office buildings and recreation centers do not grow on their own. Someone must plan, design, acquire financing and a construction permit, develop and perform possible rearrangements of the spheres in which we live, work and relax for such constructions to appear.

There is a continual need for development, because people's needs and existing financial possibilities change ceaselessly along with changes in traditions, ethnic composition of the population and outlook on life. New generations and renewing groups of immigrants moving hand-in-hand with technological evolution foster consumer taste and changes in personal choice with respect to the built environment.

RE development consists of creativity, education and art

Creativity is generally judged, as creating the greatest added economic value and benefit to society. Over 90 creative means are known at this time: analogy, empathy, synecology, brain storming, bionics, lateral thinking, mind map, concept map, TRIZ, problem solving, HBGA, Basadur SIMPLEX, biomimetics, creative aerobics, six hats, De Bono methods, project renaissance, metaphor and others (Dailė 2010). These, along with other creative means, are applicable for RE development.

Art can be understood in various ways. Next several definitions of art relevant to the process of RE development are presented (Dailė 2010):

– Art is considered a uniquely spiritual technique, and each branch of art is a somewhat differing spiritual technique.
– Art is the ability to make something finely, irreproachably and well and mastery (art of acting, art of managing, art of interacting).
– Art is the use of mastery and imagination for creating aesthetic objects, an environment or experience that can be shared with others.
– The most common and most popular meaning of art is an aesthetic-sensual expression of a human creative endeavor.

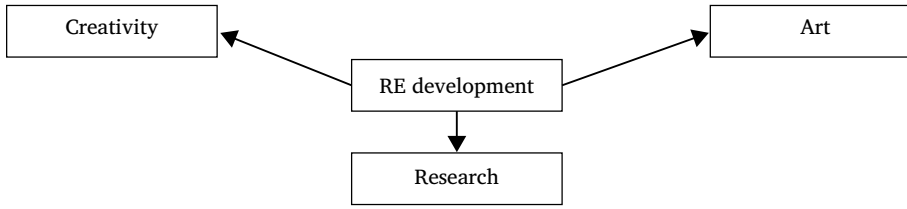

Figure 1.2. RE development consists of creativity, research and art

Research is the receipt of information (dissemination of knowledge by refuting previous theoretical models or by expanding, fulfilling existing information) while examining reality. Research is the "creation" of information. The research process encompasses scientific research and all areas of life. Summarizing publically recognized information and transmitting and conveying (such as by lecturing at schools of higher research) information are also ascribed to research. The endeavor of research as a constant process is to receive (as much as possible) information, get to know and understand reality better, be able to forecast the future and use the acquired achievements in practice. Research as a social phenomenon is an important part of society and its culture. Singular members of society and its groups (as required for especially complicated examinations) create, accumulate and systematize information by using technology, and research infrastructure and scientific method.

Therefore it can be asserted that RE development consists of creativity, research and art; it is creative, frequently extraordinarily complicated, partly logical and partly intuitive.

The RE development life cycle can be described as a model. Such a model of the RE development life cycle consists of eight stages (Figure 1.3):

– Goal setting stage;
– Planning stage;
– Market research, opportunities analyses and developer decision-making stage;
– Rational financing acquisition stage;

– Design process stage;
– Construction process stage;
– Object deliverance for exploitation stage;
– Real estate portfolio and building management stage.

The developer must maintain a way out (a strategy) – i.e., fail to perform a project to completion – at nearly all stages for different reasons (e.g., in the event of a RE and construction crisis). Renewal of a structure is also accomplished on the basis of the major stages in the life cycle model of a RE development.

As seen, various interest groups participate in the RE development life cycle: a client, developer, financial institutions, city planners, architects, project designers, economists, the national government, municipal government, market research analysts, environmental protection experts, construction materials manufacturers, suppliers, contractors, subcontractors, intermediaries for RE leases and sales, buyers, lessees, the media and facilities management organizations. Negotiations between the developer and other participants in the process can be constantly ongoing over the time of the entire RE development life cycle.

It takes land, work, capital, rational management and entrepreneurship to turn the idea that came in the goal setting stage into reality. Although the definition of RE development remains simple, the actual activity becomes more and more complicated. The product of the RE development process is a new or renewed structure – the result of the coordinated efforts of numerous experts. Development is not possible without financial support or loan, and it often requires tailor-making a number of contracts. It is only possible then to begin physically implementing a project involving participation of various interest groups, often with differing objectives. City and town communities in highly developed countries are demanding more and more often that they play the essential role in the development. For this purpose, e-community and e-city systems are being developed, especially in Scandinavian countries. Finally, the sale or lease of a structure for the planned (or higher) price is the action proving that the entire project was worthwhile. Use of the best worldwide practices and information is necessary to achieve such an objective. The duty of a developer is to assure the rationality of the RE development life cycle and its composite parts implemented for an acceptable price, as well as the satisfaction of all the interest groups of the respective project.

Information about perspective markets and marketing, the manner of municipal growth, legal requirements, local regulations, public policies, environmental protection issues, infrastructure, financing, risk control and time management are required for an effective implementation of an RE development life cycle. The ever-increasing demands raised for these areas of the RE development life cycle encourage greater specialization. A development team expands, because a developer works with experts of various fields; meanwhile, the roles of certain

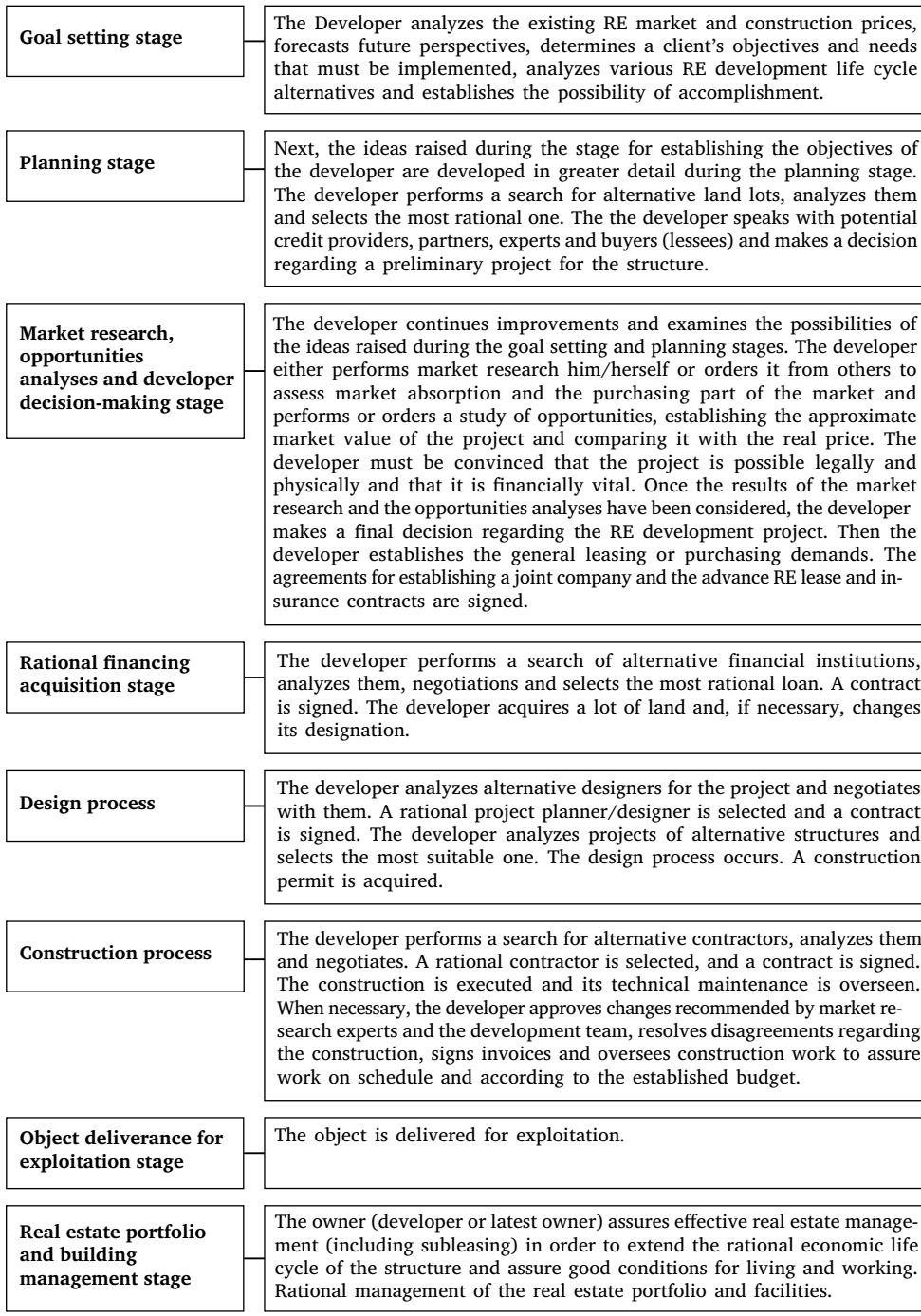

Figure 1.3. RE development life cycle model

experts have changed. A dynamically fluctuating environment demands multifaceted, interdisciplinary theoretical knowledge of a developer along with practical experience.

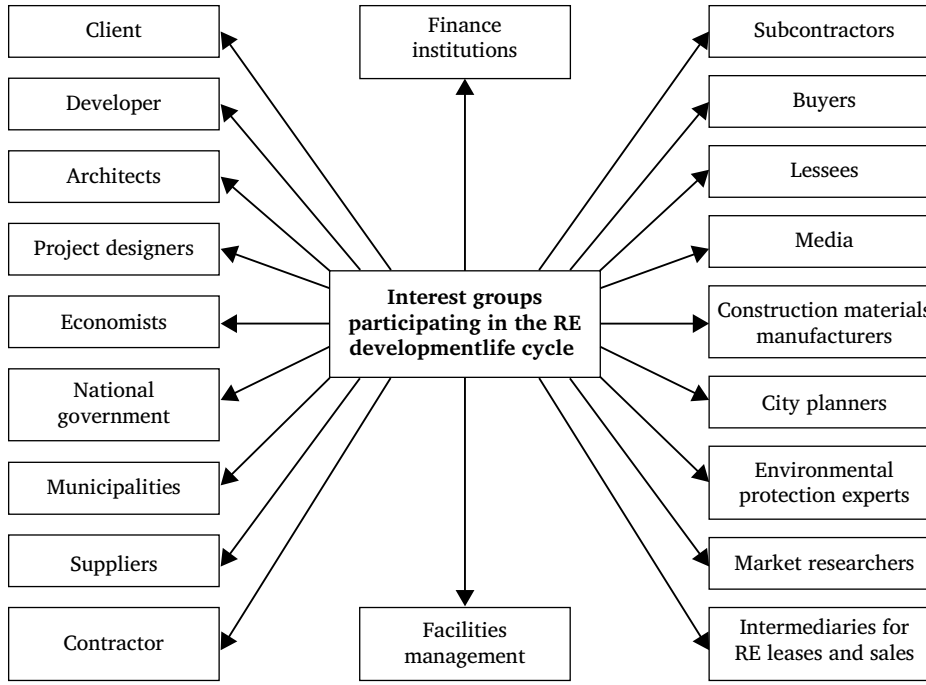

Figure 1.4. Various interest groups participating in the RE development life cycle

All the participants in a RE development process have the possibility of making rational decisions by analyzing alternatives according to an entire array of criteria (the endeavored objectives). The developers are able to learn a great deal themselves by considering RE development life cycle alternatives in depth.

However, two matters that are impossible to teach are essential for the success of real estate developer (businessperson): creativity and drive. At times a bright developer chooses a different way. Yet the developer knows the total price for a digression by using the model and is able to evaluate that price by a comparison of the motives for the digression.

A developer must reflect on all the remaining stages of the development process at every stage. In other words, a developer must make ongoing decisions knowing full well what such a decision means over the entire structure of the life cycle, not only during the closest stage. This way a developer assures that the development plan and its physical implementation will become as near to the rational structure of the life cycle, as possible. Therefore a development process must interact with various functions, including construction, finances,

management, marketing and governmental relations. These interactions occur in each of the eight stages as well as in time.

Various developers often select different strategies and tactics in their pursuit of effective results. This is perfectly natural, since their financial situations, operations market, available technology and technology in use, organizational and managerial method, organizational culture, psychological, ethical and other aspects also differ.

Far a successful strategy, a real estate developer needs to align it with its respective economic, legal, technological, technical, organizational, social, cultural, ethical, psychological and environmental, as well as its management feasibilities. Nonetheless, even the best real estate developer strategies cannot be applied in a different organization or copied. A strategy must be modeled by evaluating one's own, specific situation.

Comfort zone defines some certain types of behaviors that do not cause a person anxiety or tension. A comfort zone involves certain attitudes of thought encouraging formation and use of psychological limitations inducing a sense of safety. A person who has created a comfort zone during some period of life tends to remain in this zone, never stepping beyond its bounds, from inertia. If there is a desire to step over the bounds of a comfort zone, a person must experiment with some new or differing RE development and, thereby, face new and differing reactions appearing in the RE development environment. The boundaries of a comfort zone determine the rigidity of inner thinking. Terms describing a comfort zone can be inflexibility, boundaries or walls, habit and the like.

As one example, there is a list of information that a RE investor needs to have explained about the comfort zone of an investment: geographical location, names of the streets, name of the region, the rules and regulations on zoning, RE decrees applicable to the location, prices according to the region or to the streets, data on the market for leases, future road plans, future plans on utility services, school designations by region and ability to enter other schools, route schedules of busses and other local transportation means and so forth. Investors will be better off remembering that most of these factors can change; therefore the existing situation needs to be constantly reviewed. It could become clear to an investor that an investment will be short-term, if it becomes necessary to make do with the existing accustomed RE development and financing methods in forming an investments portfolio.

1.5. Transformational learning behavioral changes: Why it is so difficult to introduce needed innovations?

Once a developer has comprehended and realized the advantages and disadvantages of his/her everyday activities, his/her rationalization process can begin

(see Figure 1.5) in order for the daily activities to be in line with the existing information about the best worldwide experiences (organizational, managerial, technical, technological, economic, legal, social, cultural, ethical, psychological and other types of experiences).

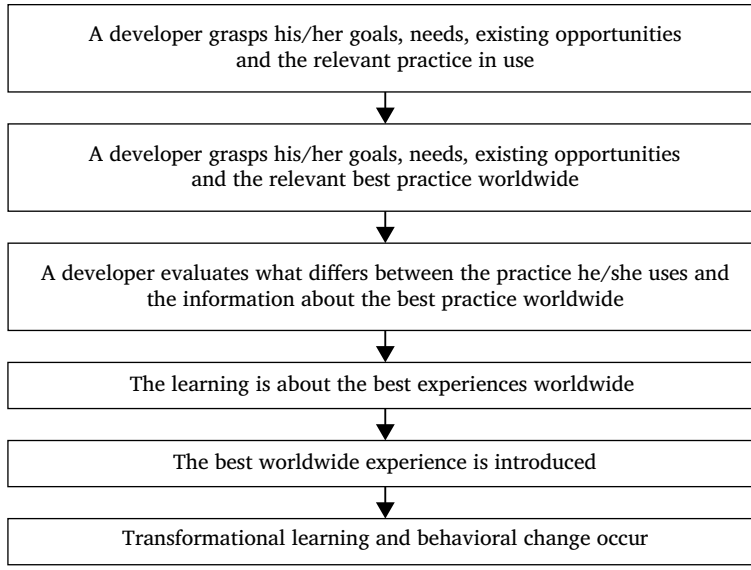

Figure 1.5. Transformational learning and change in thinking and practical practice

A developer changes his/her activities, when the results of everyday activities are insufficient to correct the results. However, if a developer is unable to notice characteristic shortages leading to an irrational result, it is probable that the problem will continue. An endeavor is made to change the main thinking and behavioral patterns during the time of transformational learning in consideration of the information the developer has acquired about the best experience worldwide. At the time of such learning, the developer should grasp what repetitive goals, needs and opportunities determined his/her thinking and practical behavior. The developer should change his/her manner of thinking to reduce his/her defensive position and become more open and more conscious. A crisis is a favorable time to change thinking and practical behavior.

There is a rather close relationship between the practical practices of managers and their ability to learn. Managers who complete best practices learning up to their implementation process can accept greater responsibility and react better to the internal and external environments surrounding them. They are capable of double-checking potential ideas and decisions and they develop alternatives regarding how to act for probable results. Thus managers begin having greater faith in their own skills, and that inspires problem-solving.

Blackman and Henderson (2001) claim that it is very difficult to introduce changes into companies where a certain kind of order has already taken hold. The usual order of things has a way of taking root for ages. Therefore employees have a difficult time changing anything in the operations of a traditional organization. Walsh and Ungson (1991) argue that it is very difficult to erase the memory of a company, because its traditional result has been a matter of some action repeated many times (whether or not it might be suitable and effective). Blackman and Henderson (2001) note the self-referential nature of the learning process as an obstacle to learning: the organization decides what, in its opinion, it should know and establishes in advance for what sorts of knowledge its employees should strive. That means that all the information coming into the organization gets filtered. It is quite complicated to change or transform matters based on the best worldwide practice in an organization, business or otherwise, that operates according to its habitual, settled order and procedures with its filters of incoming information and its deeply rooted traditions. The same can be said about the adaptation of a rational organization to external micro, meso and macro-environments in a crisis. Research was conducted at an organization in Great Britain with 2,800 employees. A sample of 12 employees-in-training was selected. The initial questionnaire of an average perspective indicated that these employees wanted to participate in the introduction process of innovations so they could improve the results of their services and work. All participants indicated that they were unable to introduce innovations for their work site. They sensed a weakening in their on-the-job standing when they attempting changing established procedures. These junior employees who questioned traditional procedures were being intimidated, and their managers were noting them as disturbers of the peace. This allowed management to control how the work was being accomplished and to reduce the chances of changes they did not like (Turner *et al.* 2006).

Probably the most difficult task for a developer is to change his/her viewpoint on traditionally performed actions. As Blackman and Henderson (2001) claim, it is extremely difficult to eradicate natural self-defense mechanisms, change routine practices and implement changes in individual and organizational contexts. This research established the main factors that blocked changes, including the fear of managers that their rule will be challenged (Turner *et al.* 2006) as well as the fear of employees that they will lose their positions upon sharing information.

A conclusion can be made that the most important obstacle in the way of introducing innovations is the behavior of managers and the comprehension of future consequences. Managers tend to safeguard the comfort zone they have created. Transformational learning (acquisition of new technological, social, psychological, cultural, ethical and other manners of behavior and learning to better understand how to interact with the micro- and macro-environments) and a

change in behavior can be considered that the conditional understanding of the micro- and macro-environments in which they operate is being changed. This could negatively affect a leader's economic and ethical state of being and social status, thereby reducing the psychological comfort zone. The interest groups that are most accustomed to traditional, familiar and settled procedures attempt to resist oncoming innovations and create a comfort zone around themselves to avoid the upcoming shakeup.

The definition of a comfort zone is a manner of behavior by some certain group that does not cause personal distress (economic, legal, social, moral, psychological, spiritual and the like). A comfort zone involves certain attitudes of thought encouraging the creation and use of psychological limitations, which generate a sense of security (often unfounded). For example, in the event of a crisis, a person who has created a comfort zone during some period in life is inclined to remain within that zone, never crossing over its boundaries. Such a person must experiment with a new and different behavior if he/she wants to cross the limits of his/her comfort zone and then face the effects of new and unaccustomed micro- and macro-environments. Bardwick (1995) holds the opinion that the limits of a comfort zone can determine a rigid internal spiritual state. The other terms that can apply to a comfort zone are inflexibility, boundaries or walls, a habit or even blameworthy behavior.

1.6. Total life analysis, modelling and forecasting of real estate development

By modelling and forecasting future perspectives and trends of real estate development, it is possible to get ready to respond to the changes of macro, meso and micro-level variables in Lithuania. Even if we suppose that macro-level factors influence the level of a whole country or industry, this research considers only their effect on the efficiency of real estate development.

The life cycle process model of efficient real estate development suggested by this research is based on presumption that the efficiency of real estate development depends on many micro, meso and macro-level variables. The presence of specific macro, meso and micro-level variable factors right away imposes objective limitations for efficient activities of real estate development. The real estate development, in presence of these objective limitations, tries to perform its functions in their bounds with utmost efficiency. For instance, organizations, being in dependency upon certain macro, meso and micro-level environment, would do their best to look for activities in such fields of real estate development and in geographic locations including the capital, various towns and districts of the country, rural districts, etc. as well as working and with such interested parties the goals of which would find maximum satisfaction.

Advanced organizations, basing themselves on this assertion, are trying to create for themselves rational environmental and operating conditions in order to achieve the best satisfaction of customers' needs, to win better reputation and to earn more profit. Therefore, basing oneself on main development trends of real estate development in advanced industrial countries, it is possible to issue recommendations on the increase of efficiency of real estate development in Lithuania. When rational variable micro, meso and macro-level factors determines for Lithuania have been realized, they should create better and more favourable conditions for efficient realization of real estate development's projects would be created.

The research aim was to produce an analytical model of the rational real estate development in Lithuania by undertaking a complex analysis of micro, meso and macro environment factors affecting it and to give recommendations on the increase of its competitive ability. The research was performed by studying the expertise of highly developed countries and by adapting it for Lithuania, taking into consideration specific history, development level, needs and traditions. Simulation was undertaken to provide insight into creating an effective environment for the real estate development by choosing rational micro, meso and macro factors.

The organizations of real estate development cannot correct or alter the micro, meso and macro-level variables, but they can go into the essence of their effect and take them into consideration when realizing various projects. Organizations, knowing the micro, meso and macro-level factors affecting the projects being realized, can organize their present and future activities more successfully.

In order to assure the efficiency of a project, it should be executed within certain bounds which are determined by the real estate development environment. The fact is that these factors are different in each country, so also the possibilities for efficient realisation of projects (see Figure 1.6) will also vary.

Figure 1.6 indicates diagrammatically the factors at macro, meso and micro level which may impinge upon the efficiency of real estate development. This means that to be efficient the real estate development must operate within certain boundaries imposed by the macro, meso and micro factors. Recognising that in each country the factors will be different, this diagram will vary accordingly. It is necessary to utilise knowledge and experience about the macro, meso and micro level factors, so as to increase the efficiency level in each country under consideration. This will be done by analysing the experience and knowledge of the highly developed countries and applying this to Lithuania.

Using taxation as an example of this, it can be appreciated that if the level of taxation is high, national firms could either go bankrupt because of increased tax liabilities, or they could decrease efficiency in the face of a lack of competition from international companies who will not attempt to enter the local market.

Similarly, if the tax level is lowered, this may cause national firms to lose market share to international companies entering the local market, or to force them to increase efficiency in the face of such competition.

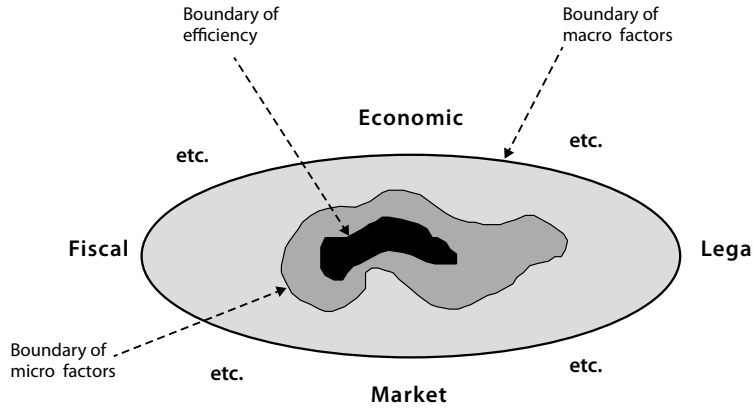

Figure 1.6. Macro, meso and micro factors which influence the efficiency of the real estate development

Such changes in taxation will alter the boundary of efficiency of real estate development. Similar real estate development environment changes can shift this boundary (the area within boundary of efficiency expresses the total satisfaction level of needs of all interested parties). For example, the Lithuanian government (in order to solve the most important problems for Lithuanian society) may abolish VAT on new residential buildings in order to promote investment in real estate. Thus the boundary of efficiency is extended to include this new development from the former situation. After development of the Lithuanian financial sector the boundary will alter again (Figure 1.6 illustrates a revised level of efficiency as an example of how to take account of these alterations).

Figure 1.7 graphically illustrates interrelationships between macro-level factors and the real estate development. The area inside the ellipse represents the positive action of specific macro-level factors on the efficiency of real estate development. The area outside the ellipse represents the negative effect of the macro-level factors on the efficiency of real estate development. Where the macro-level factors overlap a better environment for the real estate development is created. In this case the optimum environment for the real estate development is when all four ellipse areas are overlapping (i.e. economic, fiscal, legal and market). The greater the common overlapping area (taking into account the significance of the factors), the greater will be the efficiency level of real estate development. Having investigated the effects of the macro, meso and micro variables affecting real estate development in highly developed countries, differences have been identified between these and Lithuania. On the basis of

these differences, the main implications for Lithuania can be identified. Studying only one advanced industrial economy could lead to any inferences being purely subjective. However, by studying a number of countries any bias can be diminished. In other words, the presence of specific macro, meso and micro-level variable factors immediately imposes objective limitations on the efficient activities of interested parties. The interested parties, in the presence of these objective limitations, try to perform their activities in a more rational way.

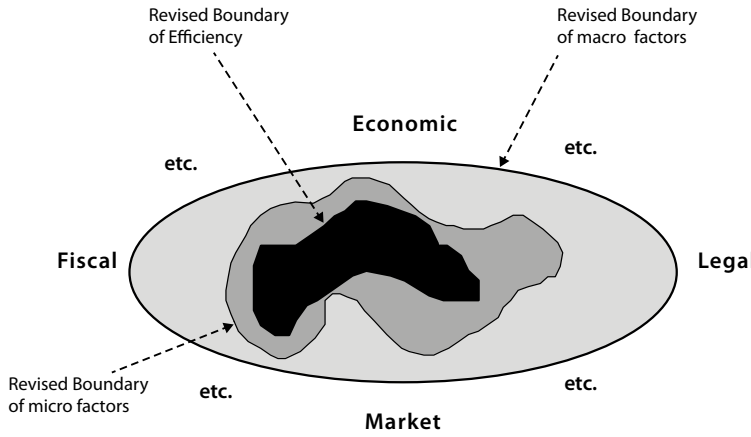

Figure 1.7. Fluctuation of efficient boundary of micro, meso and macro environment

Based on the above considerations, it is possible to propose a life cycle process model of an efficient real estate development on the basis of the performed search for a rational variable environment for Lithuania (i.e. seek to explore ways of harmonising the relationship between the Lithuanian real estate development and its environment). Upon completion of such a model, the interested parties by taking into consideration existing limitations of micro, meso and macro-level environment and existing possibilities, will be able to use their resources in a more rational manner.

This research seeks to explore ways of harmonising the relationship between the Lithuanian real estate development and its environment.

The word ‘model’ implies ‘a system of game rules’, which the Lithuanian real estate development industry could use to its best advantage.

According to neo-classical economic theory, the ultimate objective in any economic decision making process is to maximise utility for the individual, or welfare in society. However, Gruneberg (1997) noticed, that the sum of the best decisions for individuals is not necessarily the most desirable outcome for the community as a whole. For this reason, the political system is drawn into decision making as an arbiter in the planning process.

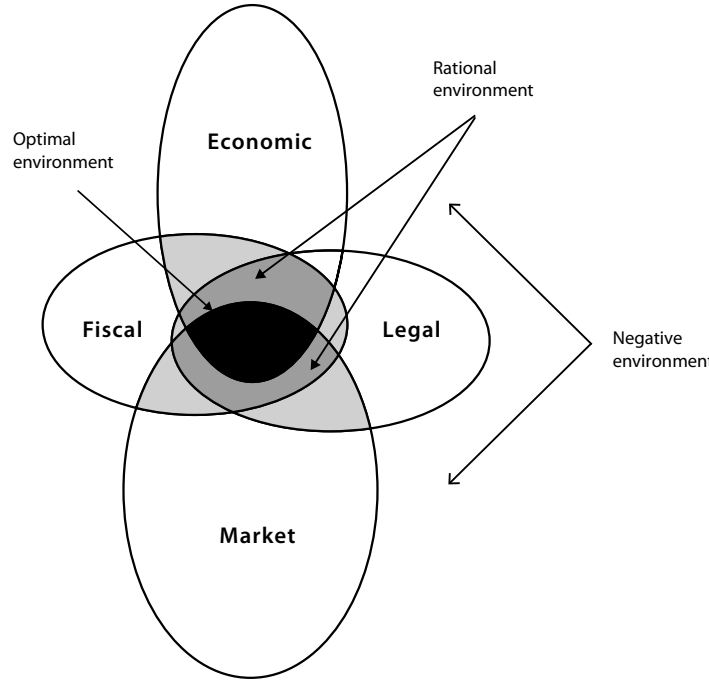

Figure 1.8. Determination of optimal, rational and negative environment for the real estate development

Gruneberg (1997) ascertains that the best economic solutions of other countries cannot just be copied. They may only be adopted in a real economic, social, political, legislation/regulation and provision situation of the state. There is no such thing as a single economic solution for all societies, that could be applied to all countries. Economic systems depend on the political objectives of government and the interaction of political groupings. Economic systems may be seen to lie on a spectrum of systems ranging from centrally-planned (or communist) to free market (or capitalist). In fact, most countries adopt economic systems that have elements of both types.

In modelling and forecasting future perspectives and the main development trends of the Lithuanian real estate development industry, it is possible to be prepared for effective changes in external conditions. The development of an analytical real estate development industry model for Lithuania was carried done by means of an analysis of experience and knowledge of highly developed countries and by their adaptation to Lithuania. In course of this research, different versions of highly developed countries practical experiences and policies in the field of real estate development industry were analysed. Initially the determination of systems and subsystems of factors describing the real estate development industry was undertaken. Then, based on these factors, the existing situation of

real estate development industry in Lithuania and highly developed countries were described in quantitative and conceptual forms. Subsequently followed the determination of trends of development (general regularities) of real estate development industry in highly developed countries and their differences from Lithuania. Having analysed (at micro, meso and macro-levels) the differences in the real estate development industries of Lithuania and highly developed countries, a model of real estate development industry for Lithuania was developed. Also in course of this analysis was produced a few recommendations on how to increase the efficiency of real estate development industry for Lithuania.

The determination and realisation of efficient variable real estate development environment in Lithuania would create better conditions for the functioning of real estate development industry.

Quantitative and conceptual analysis of real estate development industry aimed at identifying major trends of its development helped to create an analytical model of Lithuanian real estate development. It should be noted, however, that the choice of an actual trend of development in Lithuania is highly dependent on the actual situation. For example, it is quite natural that the economic, social and legislative situation in Lithuania and highly developed countries is different. This is particularly obvious when the Western countries tendency towards reduction of public expenditure on housing is considered. Reduction of public expenditure on housing will be suitable for Lithuania only in future, when a clear improvement in the housing conditions of most people has been achieved. Therefore, while working out an analytical model of Lithuanian real estate development major international trends of real estate development were considered taking into account actual economic, social, legislative, political and technological situation in Lithuania.

The investigation carried out helped to identify and describe major trends of real estate development in highly developed countries as well as providing recommendations to Lithuania in the sphere of housing. The comparative quantitative and conceptual analysis of real estate development in highly developed countries and Lithuania allowed to identify areas where the situation in Lithuania is comparable, partly comparable with or quite different from the level attained by the above foreign countries. The data of this quantitative and conceptual analysis were used in identifying real estate development trends in highly developed countries as well as providing some recommendations for Lithuania.

The interested parties of real estate development industry cannot correct or alter the micro, meso and macro-level variables, but they can go into the essence of their effect and take them into consideration in their activities. Interested parties, by knowing the micro, meso and macro-level environment affecting their projects, can organize their present and future activities more successfully.

This research has investigated the creation of an environment within which real estate development industry will utilise its resources efficiently. The needs of all interested parties creates a situation where the harmonisation of their needs is difficult. By modelling the micro, meso and macro-level factors which impinge upon the real estate development industry it is possible to recommend changes to the environment so as to create optimum conditions for efficiency. By being cognisant of these micro, meso and macro-level factors it should also be possible to ensure that real estate development industry projects take place where maximum overlap of the efficient environment conditions occur (e.g. economic, fiscal, legal and market).

This research includes the following six stages.

Stage I. A comparative description is written on real estate development in highly developed countries and in Lithuania which includes:

- A system of criteria that characterizes real estate development efficiency as established by relevant literature and expert methods.
- A description based on this system of criteria in conceptual (textual, graphical, numerical, etc.) and quantitative forms on the present state of real estate development in highly developed countries and in Lithuania.

Stage II. A comparison and contrast of real estate development in highly developed countries and in Lithuania are performed which include:

- An identification of global development trends (general regularities) in real estate development.
- An identification of real estate development differences between highly developed countries and Lithuania.
- A determination of the pluses and minuses of these differences for Lithuania.
- Establishment of the best real estate development practice for Lithuania based on actual conditions.
- An estimation of the deviation between the knowledge that stakeholders have about the best practices worldwide and their practices-in-use.

Stage III. Some general recommendations are developed on how to improve efficiency levels for real estate development stakeholders including firms.

Stage IV. Certain recommendations are submitted for real estate development stakeholders including firms. Each general recommendation proposed in Stage III contains several specific alternatives.

Stage V. A multiple criteria analysis is performed on the components of real estate development, and the most efficient version of the life cycle of real estate development is selected. Next the obtained compatible and rational components of one type of real estate development are joined into a full, real estate development process.

Stage VI. Transformational learning is performed, and the mentality and actual behavior in practice are redesigned as follows:

- Real estate development stakeholders including firms become aware and conceptualize their practice-in-use.
- Real estate development stakeholders including firms become aware and conceptualize their knowledge of the best practices worldwide.
- Real estate development stakeholders including firms estimate the deviation between their knowledge of best practices worldwide and their own practice-in-use; thereby best practice learning takes place.
- Best practice actions are implemented (understanding what recurring motives caused the initial stakeholder behaviors and redesigning their core thought and behavioral patterns).

Transformational learning takes place (acquiring new patterns of technological, organizational, management, economics, social, ethical and other behaviors and a better understanding of how to interact with the micro-, meso- and macro-environments); thereby behavior is redesigned.

In order to throw more light on the subject, further follow more detailed description of the some above mentioned stages of analysis.

One of the major tasks of an organization is to carry out its activities under the most favourable micro, meso and macro-level conditions. Efforts are made to ensure that the structure, goals, output, efficiency and quality of production of the organization would be in maximum conformity with the existing environmental conditions. The pursuit of impracticable goals, for instance, trying to realize projects which surpass the organization's capabilities or the environment (economical, social, legal, political, competitive and technological conditions) is adverse, may cause undesirable consequences.

In order to assure the efficiency of a project, it should be executed within certain bounds which are determined by micro, meso and macro-level factors.

The macro-level is the highest level upon which the effectiveness of a built environment depends. A complex analysis of a built environment on the macro-level scope (city, country) is recommended basing it of the following system of criteria (Masure 2003; Raipa 2007; Sinkienė 2008; McAvoy 2002; Chesire, Hay 1989; WebsterMuller 2000):

- *Political, legal and institutional factors* such as work cooperation between municipalities, effectiveness of city administration, the image of a city, the programs of different political parties, the governmental position with respect to certain areas of city operations (taxes, means for regulating the labor market and the like), effectiveness of the legal base of a built environment and the application of electronic democracy and electronic municipal governing. National and EU policies also require analysis, because it is essential for city heads and interest groups to understand the intentions of

national governance (along with supranational governance, such as the European Commission) in the context of city evolvement and the means the government uses to implement its policies. Legal factors are distinguished on the basis of an analysis of the laws and standardized acts. These assist in establishing the limits of allowable operations and applicable methods to represent the interests of one's own city at different levels. Political factors are notable for their dynamism, whereas the legal ones, by stability, and these assure the continuity of the main rules for city development independently of changes in the dominating political forces occurring in the city.

– *Analysis of economic factors in the external environment* that include international competitiveness for capital, labor force, institutions, arranged events and the like; unemployment levels, growth in the number of jobs and attracted investments; the business environment; productiveness of companies; capability of exploiting macro-level conditions better than the capabilities of other cities with similar natural, human, technological and other resources; governmental policies (taxes and their benefits, grants, subsidies), interest rates, inflation, currency exchange rates and documents regulating a built environment; national tax policies; tariffs and macro-economic and industrial initiatives; structure of the country's economic operations; level of innovations and application of electronic business. These factors assist in understanding the macro-economic indicators of the country or the broader region, growth trends of the external economy, fiscal and monetary policies and the specifics of corporate management as well as in evaluating the existing conditions of transportation, communications and other parts of the infrastructure with possible changes in the near future.
– *Analysis of social, cultural, ethnic and religious factors* that include memberships in networks, quality and knowledge of human resources, changes with respect to the rational expectations of the public regarding the city and the services it provides, rational city development that does not cause huge conflicts between interest groups for resources (land, money and others), political influence, development of human resources, educational level of the work force, capabilities and generation of innovations by joint work and expansion of networks, demographic changes in the country and region, the dominant family and community relationships, the situation in the area of equal opportunity and discrimination, features of the society's life style and their changes along with aspects of health and education, work and income and the criminological situation. An analysis of cultural factors concentrates on changes in the mobility of the country's or region's residents, the outlook on the major issues regarding city operations and development (forthrightness, insularity, rationality, cosmopolitism and the like).

– *Analysis of technological and technical factors* permits a timely determination of the operations opportunities and threats for that city, which outcrop due to new technologies and the conditional methods for their operations. They also condition the formation of rules regarding the directions of strategic technological breakthroughs for a certain city or the social and economic backwardness of a city due to a technological lag. In the case of a city analysis, it is also appropriate to analyze the development of informational and communications technologies operating beyond city borders, consolidation of new industrial branches, advancement in manufacturing technologies, the international and national policies for technological development and the like.
– *Review of the state and tendencies of natural and ecological environments and structures as well as their possible consequences.* Essential analyses involve indicators of the broader region (country, continent, world) for air quality, emissions, water quality of drinking water and open reservoirs, refuse handling, the condition of living nature, risk of natural disasters, physical expansion of city boundaries as well as the goals and means of national and international policies for regulating these areas.

The effectiveness levels of a built environment depend on the impact of these macro-level factors on the entirety.

Microeconomics deliberates persons and companies operating profitably in the market. It also explains how the actions of all buyers and sellers influence prices, and how prices influence the decisions and actions of different buyers and sellers (Perloff 2001). Meso-economics is the intermediary level ("meso" means the "central" in Greek) between microeconomics and macroeconomics (Holland 1987).

The effectiveness of the micro- (house, project) and meso-levels (region, organization) of a built environment can be evaluated according to the following system of criteria (Jacobs 1970, 2000; Castells 1989; Storper 1997; Sinkienė 2008; Hall 1998; Storper, Scott 2003; Petrakos, Economou 2000; Florida 2002; Scatt 2001):

– *Physical factors* referencing the supply and demand of land and facilities, prices of land and facilities, selection of an area of operations, quality of the residential environment including its pollution (hard particles, noise and so forth), infrastructure of the construction site, quality of life, geographical situation of the city and its accessibility, resources of the city's natural environment, territorial assets, advantages of the physical location, the dwelling and its location and image, size of the city or its status as capital and the city's geographical situation: Is it centrally located or in the peripheries of a country? In reference to the city's geographical situation in Europe – is it northerly, southerly or otherwise?

– *Human resources* referencing effective interest groups (residents, media, clients, consumers, project designers, construction materials manufacturers, suppliers, contractors, building utilization organizations) and an active and conscientious local community that is integrated, not splintered by social conflicts; a city like the locales distinguished for the greatest competitiveness, where companies and people want to invest and to reside; strong personal contacts of the leaders and direct contacts; a capability for attracting good employees; the qualification levels of the work force along with its innovativeness and exceptional knowledge and abilities; application of advanced techniques and technology and organizational management; opportunities for life-long learning and studying; the demographic situation along with the national and religious composition of the residents as well as the creativity, talent, tolerance, culture, traditions and the like of the residents.
– *National and EU institutions, societies and social and political organizations* referencing effective public organizations, political parties, financial institutions, municipalities and State; the numbers of national and EU institutions and the effectiveness of their operations; joint work between cities; development of public, social and strategic networks; public and private partnerships; the vision and strategy for development of the area and so forth.
– *Economic* factors referencing application of advanced economic propagation methods, services provided by the city, ability to exploit the micro- and meso-level conditions better than other municipalities or regions can, structure of the economy, operations generating high added value, local tax system, city's levels of economic compensations, accessibility of capital in the city, the city's institutions for education and research and for experimental development, the city's industrial clusters and the like.

The micro and meso-level factors of a built environment depend on the influence from the macro-level factors on their own accord. For example, a tax system established at the macro-level in accordance with the government's fiscal policies directly impacts the amount of work compensations and prices for materials at the micro-level (at the project level). The governmental viewpoint on specific operations (by various laws and resolutions, tax benefits, grants, subsidies and the like) greatly impacts organizational effectiveness. Laws directly regulate the relationships between various interest groups (e.g., a client and contractor).

The different composite parts of a built environment (home, building of a public designation, industrial buildings, infrastructure, cultural and social contacts, a system of legal, cultural and political municipal institutions and such) are considered as the integral, conditionally independent makings of a built

environment. Each one of these composite parts is made-up of even smaller elements. These can be comprehensively described on the basis of a system of quantitative and qualitative criteria, their meanings and their significances.

Various micro-, meso- and macro-level factors along with interest groups constantly affect the life cycle of a built environment. This is what forms the continuously developing and changing life cycle of a built environment.

The built environment as a research object is very complicated: it consistently competes with all the micro-, meso- and macro-levels:

– Bramezza and van Klink (1994) suggest discussing city competitiveness at several different territorial levels. They claim that city micro-regions compete amongst each other. There is also battling between municipalities that belong to the same urban region. However, urban regions compete more and more on national, continental (Europe, USA and others) or even global levels.
– Numerous authors insist the city competitiveness does not depend of different internal or external factors but from an entire set of them. Jensen-Butler (1997) emphasize that the competitiveness of a city depends mostly on its position within the system of national-international cities; its infrastructure of transportation, communications, electricity and water supply; effective actions of the city's municipality; capabilities for research and development activities and the quality of education and human resources (Piliutytė 2007).

The major objective of a built environment is the satisfaction to as great a degree as possible of the entire set of needs of *interest groups*, as the city is developed as a harmonious community. The development of harmonious communities requires consideration of more than merely traditional needs but also to aspects that are rarely analyzed in literature (the ethical, ethnic, cultural and other motives held by interest groups; social balance and social differentiation and the differences in economic development contributing to the destabilization of cities). Historical and cultural obstacles, which interfere in appropriately resolving realistic issues, hinder successful multi-leveled governing. It is noticeable that the best results are achieved, when all interest groups take responsibility for the development of a built environment. This leads to e-democracy and e-city development. What often happens is that member countries do not want to admit to the necessity of resolving the matters of their cities beyond the national level. Organizational capabilities are not being developed in a complex manner (the capability of adequately reacting to changes in the micro-, meso- and macro-levels by generating conditions for stable and effective development of a built environment and rationally considering culture, traditions and values in the effort to increase the results of economic, social and environmental activities for the built environment under discussion). Cities endeavoring to augment their

advantages and attract known international companies that develop and apply the latest technologies producing a high added value often offer such companies more favorable investment, economic and work environments and a cheaper or a more effective infrastructure than other cities do. Cities also compete wanting to retain existing highly-qualified, creative employees and businesspeople or attract new ones who would potentially be able to acquire and effectively use financial support from the EU.

Nonetheless, there are quite a few factors that are impossible to affect. These include, for example, the geopolitical situation of a city (the city's size or status as a capital), the city's geographical site (in the center of the country or at its peripheries) and the city's geographical site within Europe (at its north or its south). These factors have a great influence on the competitiveness of a built environment. For example, the built environment in northern Europe has been functioning significantly more effectively than in southern Europe over the last several ages.

The life cycle of a built environment must be implemented within certain limits to be effective, which are determined by factors at the micro-, meso- and macro-level factor. The level of effectiveness of a built environment changes as these factors change.

1.7. Theories of investment in property (use of information, knowledge and intelligent technologies)

At first sight, the area of investment in property looks anything but complicated. However, such attitude changes after a more thorough analysis of the issues related to this area. Recent books and publications about the investment in property (real estate investment) are abundant, and certain topics appear in more than one book. As an example, we will briefly list several typical topics related to investment in property and repeated in many books: investing goals, comfort zone, real estate values and trends, location, land use regulation, choosing investments (apartment complexes, hotels, office buildings, shopping centres, industrial buildings, etc.), microlevel investment analysis, macrolevel real estate investment issues (portfolio theory, the institutional landscape, etc.), measuring investment performance, management of investment process, real estate development, risk, appraisal techniques, valuation models, real estate transaction, buying techniques, negotiation, forms of ownership available to investor (partnership, corporate ownership, syndication, land trusts, limited partnerships), financing techniques (mortgage (second mortgage, adjustable rate mortgage, fixed rate mortgage, reverse mortgage, balloon mortgage, assumable mortgage, adjustable-rate mortgage), leverage, creative financing techniques), financing strategies (how to be at the right time and at the right place, etc.),

tax benefits, foreclosure, etc. Some issues related to investment in property are detailed in this chapter.

1.7.1. Investment into a building vs. investment into a built and human environment

Built environment is developed in order to meet most needs of residents. Human needs may be physiological and social and related to security, respect and self-expression. People want their built environment to have an attractive aesthetically and to be in an accessible place with well developed infrastructure, convenient communications and good roads, besides the dwelling should be by comparison cheap, comfortable, with low maintenance costs and sound and thermal insulation walls. People also are interested in ecologically clean and almost noiseless environment, sufficient options for relaxation, shopping, fast access to work or other destinations and good relationships with neighbours in place of their residence.

It must be admitted that the most serious built environment problems (unemployment, vandalism, lack of education, divorces, hooliganism, robberies, etc.) are not related to the direct physical structure of the housing. Increasing investment to the development of social, and relaxation (athletic clubs, physical fitness centres, and family entertainment centres) infrastructure, good neighbourhood and better education of young people may solve these problems.

Investment, purchase and sale of a built environment, its registration are related to legal issues. The legal system tries to reflect the existing social, economic, political and technical state of the country and the requirements of market economy.

From a social perspective, built environment can affect the society, separate groups of people and separate individuals. For example, poor dwellings are non-aesthetic, uncomfortable, can be sources of various diseases or pose acute social problems (dirty environment, drinking, hooliganism, etc.). These factors affect neighbours from various aspects. In some countries, low-income households (retirees, large families, the unemployed) often cannot afford to pay for the utility services (heating, hot water) without state support. In case of failure to solve this problem at the national level, the ruling party may loose considerable constituency during the next election. Thus the problem is not only social but also political. Similar problems occur when governments attempt to create better conditions for long-term mortgage loans and must intervene into financial markets.

Built environment is not constructed in an empty space. During their lifecycle (brief, designing, construction, maintenance, facility management, renovation, demolition and utilization) buildings are affected by various micro, meso and macro level factors.

It is estimated that about 20% of the USA's population suffers from asthma, emphysema, bronchitis, diabetes or cardiovascular diseases and are thus especially susceptible to outdoor air pollution (American Lung Association, 2005). Outdoor air quality plays an important role in maintaining good human health. Air pollution causes large increases in medical expenses, morbidity and is estimated to cause about 800,000 annual premature deaths worldwide (Cohen *et al.* 2005). Much research, digital maps and standards on the health effects (respiratory effects, cardiovascular effects, cancer, reproductive and developmental effects, neurological effects, mortality, infection and other health effects) of outdoor air pollution, a premise's microclimate, and real estate valuation, has been published in the last decade. The above-mentioned and other problems are related to a built environment's air pollution, the premise's microclimate, health effects, and real estate market value, etc.

The provided examples allow making a conclusion that various stakeholders prefer the concept "built and human environment" to the concept "built environment" usually. This proposition is especially true when not only the built environment but also the surrounding micro, meso and macro environment is considered as the research object.

Currently built environment is characterized by the intensive creation and use of information, knowledge and automation (software, knowledge, expert and decision support systems, neural networks, etc.) applications. It is commonly agreed that use of these applications would speed up built environment processes significantly, would improve the quality of built environment and the value of decisions made and would decrease the overall cost of a built environment's life cycle.

1.7.2. Comfort zone

A comfort zone denotes that limited set of behaviors that a person will engage without becoming anxious. A comfort zone is a type of mental conditioning that causes a person to create and operate mental boundaries that are not real. Such boundaries create an unfounded sense of security. Like inertia, a person who has established a comfort zone in a particular axis of his or her life, will tend to stay within that zone without stepping outside of it. To step outside a person's comfort zone, he must experiment with new and different behaviors, and then experience the new and different responses that then occur within his environment. The boundaries of a comfort zone to result in an internally rigid state of mind. A comfort zone may alternatively be described with such terms as rigidity, limits or boundaries, or habit, or even as stigmatized behavior (Bardwick 1995).

For example, the following is a list of the information that real estate investor should strive to learn about investment comfort zone (Quadreal 2007): geographic layout; street names; subdivision names; zoning rules & regulation;

local ordinances that affect real estate; price ranges by subdivision or streets; rental market data and rents charged; future road plans; future utility plans; future developments in the planning stages; local employment statistics; employment trends; major impacts that will affect employment trends; the "how" and "who" of local government; "what", "how" and "who" of the local building department; school districts and how to get in to other schools; bus and other local transportation routes; "what", "who" and "how" of public records; names of prominent business leaders in the community; sources for local financing. The investor should to keep in mind that many of these factors change from time to time and thus a constant review of the current circumstances is required.

Also build the investment techniques (the option agreement, the lease option agreement, wrap-around mortgages and secondary seller-held financing, sweat equity, etc.) required. Investor can find that investment will be short lived if he needs to rely on conventional methods of purchasing and financing the properties that he find in his comfort zone. These techniques will become the tools for building investment portfolio (Quadreal 2007).

1.7.3. Real estate investing and portfolio theory

Real estate investing involves the purchase of real estate for profit. Profits are accumulated slowly by renting out properties in a cashflow method, or are generally improved and resold for a capital gain. In addition, real estate investors may wholesale properties as a means to make profits. The biggest factor in marketability of an investment is supply and demand. Leverage, or the ability to borrow based on the value of the property, is probably the on of the greatest advantage. It is much easier to finance real estate than any other product. While investing in most assets requires the purchaser to have the full purchase price available for the asset, in real estate investing, one only needs to have a fraction of the purchase price available (like 5%, 10% or 20%) as a down payment. Therefore, real estate, although incredibly expensive, is still easier to buy than say, a piece of industrial equipment of the same value. Real estate is an illiquid investment that needs maintenance and taxes to be paid. A balanced investment portfolio has some liquid assets that can be quickly converted to cash to sustain the real estate when its returns are not sufficient to pay its recurring costs (RLI 2008).

Portfolio Theory originally developed by Harry Markovitz in the early 1950's, Portfolio Theory – sometimes referred to as Modern Portfolio Theory – provides a mathematical framework in which investors can minimize risk and maximize returns. The central plank of the theory is that diversifying holdings can reduce risk, and that returns are a function of expected risk (Portfolio theory 2007). The key result in portfolio theory is that the volatility of a portfolio is less than the weighted average of the volatilities of the securities it contains (Portfolio theory 2006). The volatility is the standard deviation of expected return on a

security. The volatility therefore changes with the period of times over which it is measured (Volatility 2007). The expected return on most investments is uncertain, however it is possible to describe the future returns statistically as a probability distribution (Expected return 2007).

An efficient portfolio is one that lies on the efficient frontier (Efficient portfolio 2007). The efficient frontier describes the relationship between the return that can be expected from a portfolio and the riskiness of the portfolio. It can be drawn as a curve on a graph of risk against expected return of a portfolio. The efficient frontier gives the best return that can be expected for a given level of risk or the lowest level of risk needed to achieve a given expected rate of return (Efficient frontier 2007). An efficient portfolio provides the lowest level of risk possible for a given level of expected return. If a portfolio is efficient, then it is not possible to construct a portfolio with the same, or a better level, of expected return and a lower volatility. An efficient portfolio also provides the best returns achievable for a given level of risk. If a portfolio is efficient it is not possible to construct a portfolio with a higher expected return and the same or a lower level of volatility with the securities available in the market, which excludes risk free assets (Efficient portfolio 2007).

Investors can reduce risk, and improve the level of risk relative to return, by diversifying their portfolios. The key to diversification is to choose investments whose prices are not strongly correlated. Firstly, investing in different sectors, geographical regions and classes of security improves diversification: the values of shares, bonds and pieces of real estate will be more correlated with each other than with investments of completely different types (Diversification 2007).

Life cycle portfolio models are designed to identify optimal savings and portfolio policies over the lifetime of investors. The standard portfolio theory introduced by Markowitz (1952) is static in nature, since it explores investment decisions for only one period. A more realistic setting must account for the multiperiod dimension of the portfolio choice problem. Only under very specific circumstances, the optimal portfolio structure is time invariant. In this special case, a one-period optimization suffices to characterize the optimal portfolio choice also in a multiperiod environment. Under more general conditions, however, investors will restructure their portfolios in reaction to changes in income, the accumulated wealth and the investment opportunity set. This possibility to adjust the portfolio composition affects the initial investment choice (Wallmeier, Zainhofer 2006).

Sufficient software items and intelligent systems are developed for Real Estate Investment. Several are briefly described further.

Real Estate Offer Generator (2007) is a real estate software that calculates the offer price for a rental property. Generator can help users to buy properties that make positive cash flow. The software uses an easy-to-use interface in

order to help investors calculate the Net Operating Income, create the various offers and initial offer letter, and calculate the cash flow and projected cash flow for each of their options. The software allow professional (and amateur) investors to gain a strong advantage in real estate investments and move on a solid mathematical basis.

The classical Markowitz-Sharpe optimization model for investment portfolios gets applicable in practice as Real Estate Offer Generator (2006). The software allow customer to import market data, define groups of assets, specify legal and market constraints and then find the optimum portfolio composition.

Real Estate Notebook (2007) can help real estate investors analyze and organize investment properties. The software performs calculations crucial to property analysis including mortgage amortization, total expenses, return on investment, net operating income, depreciation and many others. Real Estate Notebook can store all analyzed properties for later viewing or reporting based on criteria you specify. The software includes a unique portfolio reporting feature that shows the performance of your real estate portfolio as a whole and a charting feature for quick visual head-to-head analysis of properties.

Software for real estate investment (2007) produces projections and presentations of up to 20 years for office buildings, industrial buildings, shopping centers, apartments and mixed-use properties. Customer can forecast commercial revenue stream in detail, as well as operating expenses, pass-throughs, financing, cash flows, tax liability, resale, rates of return and partnership allocations. Software for real estate investment (2007) also released two optional add-on products that allow to compare multiple investment-property scenarios and to perform portfolio analysis.

Real Estate Tracker (2007) was created to help customer make intelligent, accurate choices for residential investment properties and integrate real estate portfolio with a tool to track customer income and expenses in an easy to use budget tracker. Real Estate Tracker is an online property investment tool designed by investors for investors to empower customer with the information will need to leverage return on investment and accurately track real estate cash flow over time. Real Estate Tracker (2007) can help to identify the best properties to buy, identify when the right time is to sell or when do a tax-deferred exchange, when to raise rent, and alert when customer should pull equity to purchase new investments.

1.7.4. Mortgage and e-mortgage

Mortgage is an instrument for lending money on real estate. The property is pledged as security for the loan, and the lender has the right to take over the property if the borrower defaults on the terms of the loan. Mortgage derives

from two French words meaning dead pledge, because when the loan has been repaid, the mortgage is considered void or dead (Grass 2007).

There are many types of mortgage loans. The two basic types of amortized loans are the fixed rate mortgage (FRM) and adjustable rate mortgage (ARM). In a FRM, the interest rate, and hence monthly payment, remains fixed for the life (or term) of the loan. In an ARM, the interest rate is fixed for a period of time, after which it will periodically (annually or monthly) adjust up or down to some market index. Adjustable rates transfer part of the interest rate risk from the lender to the borrower, and thus are widely used where unpredictable interest rates make fixed rate loans difficult to obtain. In most scenarios, the savings from an ARM outweigh its risks, making them an attractive option for people who are planning to keep a mortgage for ten years or less. Additionally, lenders rely on credit reports and credit scores derived from them. The higher the score, the more creditworthy the borrower is assumed to be. Favorable interest rates are offered to buyers with high scores. Lower scores indicate higher risk to the lender, and lenders require higher interest rates in such scenarios to compensate for increased risk (Patrick 2007).

There are essentially two types of legal mortgage: a mortgage by demise and a mortgage by legal charge. In a mortgage by demise, the creditor becomes the owner of the mortgaged property until the loan is repaid in full (known as "redemption"). This kind of mortgage takes the form of a conveyance of the property to the creditor, with a condition that the property will be returned on redemption. This is an older form of legal mortgage and is less common than a mortgage by legal charge. In a mortgage by legal charge, the debtor remains the legal owner of the property, but the creditor gains sufficient rights over it to enable them to enforce their security, such as a right to take possession of the property or sell it. To protect the lender, a mortgage by legal charge is usually recorded in a public register (Mortgage 2007).

Leece (1997) reviewed recent developments in the design and innovation of mortgage instruments in the UK, from the early to mid-1990s. Rasmussen *et al.* (1997) presents a more expansive view of reverse mortgages as a financial tool for tapping housing equity for various purposes and at various stages in the life cycle. Dyk (1995) examine the mechanisms used since the 1970s to finance social housing in Canada. He demonstrates that direct government assistance has proven to be the most cost-effective mechanism. Experimentation with alternative mortgage instruments such as the graduated-payment mortgage and the index-linked mortgage has also been central to the attempt to minimize subsidy and financing costs. Dhillon *et al.* (1990) evaluate the choice between 15-year and 30-year fixed rate contracts in the USA and estimate a simple profit to represent this choice. Lam *et al.* (1998) developed a model for financial decision-making which provides a method of solving borrowing decision problems. Leece

(2000) estimates reduced form credit demand equations that reflect the interactions between the choice of mortgage instrument, the lessening of mortgage rationing and liquidity constraints and the demand for housing debt. Most of these studies have concentrated on single objective decision-making.

The housing finance systems differ greatly from country to country. As Renaud (1999) stated, there are profound differences among the 180 developed and developing countries that are now members of the World Bank. The advanced housing finance systems can be found in OECD countries. Renaud (1999) show that, these systems grew out of two main traditions: Anglo-Saxon systems where the building societies of the UK and the savings and loans from the US are mutual forms of housing finance. There is also the mortgage bank tradition of continental Europe where term funding was mobilised through bond markets.

There are a wide and growing literature on the choice of housing investment instruments. This mainly concerns the econometric estimation of the demand for fixed rate mortgages compared with adjustable rate mortgages. There is also an amount of empirical work on the mortgage choice between the conventional annuity mortgage and payment via saving in a diversified portfolio of assets.

When a homeowner defaults by failing to make payments on his or her mortgage, the bank or financial institution that holds the mortgage note may foreclose on the property. Foreclosure gives the legal ownership of a property to the bank to allow the bank to recoup its investment. Foreclosure proceedings vary by state but usually involve court appearances to ensure the foreclosure is warranted. Pre-foreclosure sale can allow a defaulting borrower to sell the mortgaged property to satisfy the loan and avoid foreclosure. Foreclosure sale following foreclosure. The proceeds of the sale are used to pay the mortgage debt, with any excess going to the mortgagor (the property owner) (Schwartz 2007).

In general terms the main participants in a mortgage are creditor, debtor and other participants (mortgage broker, financial adviser). Creditor has legal rights to the debt secured by the mortgage and often make a loan to the debtor of the purchase money for the property. Typically, creditors are banks, insurers or other financial institutions who make loans available for the purpose of real estate purchase. The debtor or debtors must meet the requirements of the mortgage conditions (and often the loan conditions) imposed by the creditor in order to avoid the creditor enacting provisions of the mortgage to recover the debt. Typically the debtors will be the individual home-owners, landlords or businesses who are purchasing their property by way of a loan. Due to the complicated legal exchange, or conveyance, of the property, one or both of the main participants are likely to require legal representation. Because of the complex nature of many markets the debtor may approach a mortgage broker or financial adviser to help them source an appropriate creditor typically by finding the most competitive loan (Patrick 2007).

Clearly, the Internet is poised to have a significant impact on the real estate capital markets, serving primarily as a new platform for the delivery of data and services. Through on-line mortgage firms, real estate finance seekers can easily find information about mortgages, rates, fees, duration and upcoming offerings. Closing a deal is still a traditional transaction. In order to solve real estate finance issues more efficiently virtual loan and financing markets are created. Developers, brokers, investors and lenders are involved in these activities. These virtual loan and financing markets contain real estate software and intelligent systems that facilitates it activities. When considering applying for a loan with a mortgage company, an investor should determine the following: interest rate, time required for approval and closing the deal; loan service ease; familiarity with and perceived professional competencies of the loan staff. After a lender's selection a mortgage package is required for submission with the mortgage application so that the lender can approve it. The mortgage package contains many items: e.g. a mortgage application listing the amount of loan requested, personal financial data of the borrower, the borrower's job history, real estate to be purchased, and the agreed sales price. Further it contains a verification of employment and salary; credit checks; real estate appraisal; verification of bank deposits and/or loan amounts, etc. There are many on-line mortgage brokers. Though many consumers are researching loans on-line, few are closing loans through the Web.

One of the most important goals of a potential home buyer is to find the best possible variant of credit. It can be claimed that discovery of the best possible loan equals to discovery of the best dwelling for lower income households, who not only become home owners but also assume a serious financial commitment. Types of loans are abundant, and search for and assessment of all of them is a rather complicated process for the consumer. The so-called sector of intermediaries deal with these issues; their aim is to put in touch those who demand and those who offer loans. It usually costs big money to the person who searches for a rational loan life cycle. Such process of search for loans and filing of applications for them includes human and „bureaucratic" expenditures and increases the cost several times compared to e-loan.

Some companies are already offering online services, which allow clients to search for and get loans from numerous alternative creditors. By sending queries, they can get comparisons of interest rates and charges, and the most appropriate variant can be selected by a mere mouse-click. The loan is perceived as a commodity, and its selection is primarily based on determination of buyer's (who seeks a rational loan life cycle) needs and finding the seller (who can supply the loan) who meets the needs best. This process is absolutely internet-friendly and is more efficient and effective than the services of traditional agents. In order to be able to compare conditions offered by various credit suppliers easier, it must be granted that the information provided by the suppliers is as precise as

possible and unified nationwide. Otherwise, if one of the loan suppliers provides incorrect or incomplete data about the offered loan package, a consumer can be mislead and the selected loan can be not the most rational.

1.7.5. Explicit and tacit knowledge in a real estate investment

By finding, capturing, and sharing explicit and tacit knowledge, investors can significantly improve results. On of the main role of explicit and tacit knowledge management in real estate investment is sharing best practice. Throughout the world there are many examples of the adoption of the best practice (investing process, appraisal services, brokerage, consulting, insurance, matching/listing services, mortgages, project development, real estate finance, real estate's transaction process, etc.) by the major players in real estate investment.

Explicit knowledge is comprised of documents (investment appraisal, feasibility study of an investment project, balance sheets, buy-sell agreements, insurances, market analysis, contracts, declarations, etc.) and data that are stored within the memory of computers. This information must be easily accessible, so that an investor could receive all the necessary knowledge without disturbances. Explicit knowledge is information that is widely used in information technologies.

Knowledge is the integrated sum of physically intangible resources, the bigger part of which is tacit: skills, competences, experiences, organizational culture, informal organizational communication networks and intellectual capital of an organization. It is frequently believed that the utmost knowledge resource leaves the organisation at end of each working day in the heads of employees. Capturing the tacit knowledge of individuals in a way that can be leveraged by companies is perhaps one of the biggest challenges in real estate investment. The main investor knowledge is tacit. The creation and distribution of tacit knowledge requires creativity and competence. Tacit knowledge is a mixture of informal and non-registered procedures, practice, skills, deliberations, subjective insight, intuition and judgment that investor acquire by virtue of their experience and expertise. This knowledge is vitally important because it defines the abilities and experience of investor. Tacit knowledge represents an important intellectual resource that cannot easily be duplicated by competitors. Tacit knowledge must be converted into explicit knowledge so that it can be recorded. Recorded knowledge is static and can soon become outdated. Innovative organisations establish an environment where knowledge is continuously created, captured and disseminated.

The transfer of tacit knowledge is unverifiable and requires face-to-face contact, creation spatial nearness significant. Experts can share information about a current investment issue, problem, or topic through meetings, workshops, seminars, video conferencing, e-mail, intranet based discussion groups, extranets, telephone, working on joint projects, coffee conversations, canteen discussions,

brainstorming sessions.

Different knowledge capture techniques (interview, on-site observation, brainstorming, protocol analysis, consensus decision making, nominal-group technique, Delphi method, concept mapping) can be used to capture tacit knowledge and writing down tacit knowledge in the form of investment appraisal, feasibility study of an investment project, buy-sell agreements, market analysis, contracts, methodology. Once knowledge is captured or codified it's no longer tacit.

1.7.6. Best practice in a real estate investment

Much more attention has to be paid to knowledge creation and its distribution in the form of the knowledge and data bases of best practice, and this has recently begun in the most progressive activities of real estate investment. Throughout the world there are many examples of the adoption of the best practice by the major players in real estate investment. Some of their works are presented in the following list: comfort zone, land use regulation, choosing investments, investment analysis at microlevel, macrolevel real estate investment issues, measuring investment performance, management of investment process, real estate development, risk, appraisal techniques, valuation models, real estate transaction, buying techniques, negotiation, forms of ownership, financing techniques, financing strategies, etc.

Search, storage, management and improvement of the best practice, and the best practice knowledge and data bases created on their basis, is one of the newest priorities of real estate investment in most advanced countries. Comparative analyses of the best practice are becoming more popular in the real estate investment. Comparative analyses are based on the analysis of the best examples of services available to clients. On the basis of comparative analysis, certain recommendations are formed, indicating how to provide services of higher quality and how to better serve the needs of clients. Comparative analyses provide the possibility to quickly and efficiently understand and apply the methods, which could help to achieve the quality of client service at a world-class level.

The best practice in the real estate investment is obtained in different ways, e.g. applied research, wisdom and experience stored by practices, experiences of clients and other stakeholders, and opinion of experts, etc. Databases and knowledge bases of the best practice are knowledge-obtaining tools, which allow one to save a lot of time, provide information on the best real estate investment practice in different forms (studies, reports, agreements, market analysis, contracts, declarations, e-mail messages, slide presentations, text, video and audio material).

Stakeholders most often are trying to achieve different economic, comfort, technical, technological, social, political and other aims. Different means could be used to achieve them. Some aims are not so easy to be achieved, and others

might require more expenses. The best practice allows one to not limit oneself only to the implementation of economic aims; it creates conditions to reach a higher level and realise, from what perspective this practice was named as the best one. The main problem of many best practices is the way they are presented, i.e. they are suggested, by not taking into account certain situation.

Comparative analysis systems of the best practice help investors to determine directions of priority for their increase in activity efficiency and ways of determining achieved progress, measuring investment performance which allow one to compare the performed investments with existing investments; as well as, determining the spheres that are lagging behind and suggest theories and practices of investment in property to eliminate these gaps. Modern investors know how to use the possibilities of a comparative analysis, and therefore decrease their expenditure and increase competitiveness.

1.7.7. Information gathering and comparison intelligent agents

One of the major problems in Web-based information systems is to find what you want. The number of alternative real estate investment products and services on the Internet are in the thousands. How can customers find the rational investment products and services on the Internet? Once investment product or service information is found, the customer usually wants to compare alternatives. There are a specific class of information gathering and comparison intelligent agents: search on hypertext files by agents, search alternatives on databases, alternative search and tabular comparison, comparison of alternative products and services from multiple malls, search and multiple criteria decision-making.

It may be expensive for brokers and users to find each other. On the Internet, for example, thousands of products are exchanged among millions of people. Brokers can maintain databases of user preferences and supplier (i.e. provider) advertisements, and reduce search costs by selectively routing information from suppliers to users. Information gathering agents, called *worms* and *spiders*, are used to gather information about the contents of the Internet for use in search engines – are consuming quite a lot of bandwidth with their activities. Information gathering agents can reduce the waste of bandwidth. This reduction is achieved by such things as:

- Using results and experiences of earlier performed tasks to make future executions of the same task more efficient, or even unnecessary. Serious attempts are being made where agents share gained experience and useful information with others.
- Using the “intelligence” of agents to perform tasks outside peak-hours, and to spread the load on the Internet more evenly. Furthermore, agents are better at pinpointing on which hours of the day there is (too) much activity on the Internet, especially since this varies between the days of the week

as well (Hermans 2000).

The authors have developed Cooperative Integrated Web-Based Negotiation and Decision Support System for Real Estate (Kaklauskas *et al.* 2005). Proposed Web-based Intelligent DSS for Real Estate can create value in next important ways: search for real estate alternatives, finding out alternatives and making an initial negotiation table, multiple criteria analysis of alternatives, negotiations based on real calculations, and determination of the most rational real estate purchase variant.

1.7.8. e-Brokerage and e-transactions

Under the traditional system, the real estate agent offers a package of services: showing real estate, advising sellers on how to make the real estate more marketable, assessing current market conditions, providing information about real estate values and neighborhoods, matching buyers and sellers, negotiating the sale price, signing contracts, arranging for inspections, and assisting with closings, and so on.

The Internet and intelligent technologies can disaggregate the above services: the Internet searches for real estate, finds alternatives and prepares comparative tables, databases that provide information about real estate, their values and neighborhoods, match buyers and sellers, negotiate the sale price, assist with real estate selection, and lender selection, provides smart software for boilerplate contract's language, and personalized websites that manage complicated transactions.

Brokers usually work for a commission, acting as intermediaries between buyers and sellers. Brokers are involved in matching, negotiating, and contracting. In general, sellers and renters set preliminary prices and these are then negotiated. However, direct negotiations are sometimes undesirable or unfeasible.

Many of the new investment in property portals make economic sense in that they make life better (cheaper or faster) for somebody. The greatest real estate opportunity for big profits appears to be in brokerage (both leasing and sales). Brokers whether human or electronic, can address the following five important limitations of privately negotiated transactions:

- Real estate search costs. The residential brokerage system already has databases in place with shared listings, making transitions to a Web based system for the sharing of information fairly and this is straightforward. Brokers can maintain Multiple Listing Services and reduce search costs by selectively routing information from sellers or renters to consumers and by matching customers/clients with residential buildings. Brokers with access to a customer's preference data can predict demands. Some brokers already offer such services.

- Lack of privacy. Either the buyer or seller may wish to remain anonymous or at least to protect some information that is relevant to a trade. Brokers can relay messages and make pricing and allocation decisions without revealing the identity of one or both parties.
- Incomplete information. The buyer may need more information than the seller is able or willing to provide, such as information about a building's quality and the market value. A broker can gather building information from sources other than the building's seller, e.g. independent evaluators.
- Risk. The broker may accept responsibility for the behaviour of parties in transactions that it arranges and act as an inspector on his/her own.

Ham and Atkinson (2003) focus on five key aspects of the home buying and selling process and discuss barriers to transformation and changes in law and regulations for each:

1. Improving computerized access to and accuracy of credit reports by standardizing reporting data to allow for one-stop correction at all credit bureaus and requiring more accountability for accurate reporting of credit history;
2. Facilitating computerized shopping for mortgage interest rates by tandardizing forms and eliminating protectionist rules that favor in-state bricks-and-mortar lenders;
3. Unbundling the functions of real estate agents by encouraging competition for brokerage and listing services and disclosing alternatives to buyers and sellers;
4. Streamlining the recording process to cut costs and reduce risks associated with incomplete or inaccurate land records by establishing electronic recordation systems;
5. Reducing the costs and paperwork associated with the settlement process by encouraging digital signatures and online settlements.

Many buyers and sellers hire professional agents as the first step in making a sales deal in the real estate market. The agents perform numerous functions: they advice the seller on making its object for sale more attractive for the market, they help to prepare and collect various documents, they represent the client's interests in the negotiations on the price and they guide him/her through a number of mandatory phases of a real estate deal until moving into the new home. Although these services are really useful, most buyers and sellers claim that the primary reason to hire an agent is to find a suitable dwelling or a buyer/seller. The services of a real estate agent are charged as a commission fee, which is paid by the buyer or the seller and usually makes about 6% of the deal's value. Usually, the seller pays all 6% to its agent, who, in turn, offers part of the amount to another agent who found the buyer (if the buyer is not represented by any other agent, the seller's agent retains all 6%). Information,

knowledge and intelligent technologies can reduce these expenditures considerably. Broader application of IT could make prerequisites for a buyer to select only the desired services of an agent, and to leave the remaining services for intelligent technologies.

Online search for home or mortgage also saves the consumer's time; a consumer who makes a search using other than web-based means wastes more time undoubtedly. Those real estate buyers who search in internet can view considerably more potential objects than consumers who use the services of a regular agent. Increased use of IT should also influence the standard commission fee (6%), i.e. the fee which is more related to culture and tradition than is based on market logics. Agents provide valuable services, and many buyers and sellers will always prefer services of an agent who offers a full service portfolio. However, it must be clients and not the agent who should decide what services to buy.

A website of a notary could specify all documents that are needed to complete the deal and which would be available for thorough analysis of all deal's stakeholders. Each document could be signed by a digital signature and sent via electronic means, thus saving time and money which would be needed to organize a meeting. Implementation of this process requires changing of laws and revocation of the mandatory participation of lawyers in the process of deal finalisation. Although the client has a right to select its own lawyer, this action only increases the client's expenditures anyway. A transparent and unified e-signature system is required for this purpose. Strict identification of users who use e-signatures should be granted.

The authors have developed Real Estate's Market Value and a Pollution and Health Effects Analysis Decision Support System (Zavadskas *et al.* 2007). Developed System can create significant value for e-Brokerage and e-Transactions.

1.7.9. Project development

Many new laws and practices (such as environmental impact reviews, historic preservation requirements, growth controls, sewer moratoriums and impact fees, etc.) served to slow the development process and add to the costs of real estate development. Developers find themselves increasingly involved in public relations campaigns and public policy initiatives, working with local residents, business and civic groups, community leaders and government officials to have projects approved by agreeing to pay a greater share for public facilities and amenities. They also are busy finding new ways to address neighbourhood concerns and mitigate the perceived negative effects of proposed development. All of which might be decided more easily by using project development Web sites.

The full-service needs of large projects are now being met by a new generation of Web sites that integrate virtual community creation, on-line collaboration

and support services to developing an environment in which the whole process from the design stage to the facility management process is running smoothly. These Web sites bring together investors, designers, economists, building material manufacturers, suppliers and contractors and mortgage brokers involved in project development. Some developers, construction firms and contractors have their own specific, project-linked Intranets.

In order to increase project development's efficiency various software, expert and decision support systems are used. One such computer software system is Commercial/Industrial Development Software. This software performs a complete project cost analysis for any new commercial income property. It also provides the developer with an excellent budget 'pro forma' for presentation to a lender, partner or client. The report includes a project summary and overview, financing and leasing information and a pro-forma operating statement and resale projection. The report summarises land, development, architectural, financing, construction and lease-up costs. Developers, contractors, lenders and others who will be involved in the construction or rehabbing of a commercial, industrial or multi-unit residential income property use this software. Interested parties often use this program to analyse the development phase, and then also use Real Estate investment analysis software to project the performance of the property over time. This software allows one to produce a comprehensive 10-year projection for any type of residential or commercial income property and to construct anything from a simple and straightforward analysis to a highly sophisticated investment scenario. This software is devoted to all who deal with commercial or residential income properties: individual and institutional investors, brokers, appraisers, lenders, attorneys, accountants, portfolio managers, financial planners, architects and developers, etc.

1.7.10. Real estate's transaction process and investment multiple listing service

Steps in a real estate transaction process are represented by the example of residential transactions. The real estate transaction process can be divided into five stages: listing, searching, evaluation, negotiation, and closing transactions. Transaction costs will be reduced directly through a reduction in underwriting costs as appraisals, environmental reviews, title insurance, and other vendors are efficiently contracted and managed through the Internet. Faster and higher-quality information flow between brokers, owners, lawyers, vendors, lenders, and other participants in the transaction process will reduce costs.

A seller may place information about a real estate intended for sale in various real estate-for-sale databases called Multiple Listing Service (MLS). Real estate-for-sale databases are operated by the local real estate's broker-board and on the basis of such databases clients can very quickly find a house they

want. MLS are primarily financed by the sellers, either from the commissions they pay when they list a house with a real estate broker or directly to the maintainer of the site. The service lists of real estate for sale and data on sales is made by brokers. Statistical data regarding listings, sales and data about the market and information on the trends are also often provided. MLS data is essential for the professional real estate agent and the appraiser who wants to offer clients a wide variety of available properties and current market data. MLS, in most areas, represents the vast majority of properties offered for sale. The MLS does an efficient job of quickly selecting specific types of sales in a specific area from the hundreds and thousands of recorded sales. As a rule, sellers are trying to highlight the positive aspects of the house and suppress drawbacks and defects.

After finding all the possible alternatives they should be assessed. The real estate needs to be assessed because each buyer has a different understanding about the quality of the real estate. The buyers also pursue their own specific goals. For instance, a buyer wants to have a relatively cheap and comfortable house with low maintenance costs plus, good thermal and sound insulation of the walls and a good external aesthetic appearance of the house. Furthermore, he/she desires to have an ecologically clean and quiet living surrounding with good relaxation and shopping facilities, good neighbours and excellent transport connections to drive to work or elsewhere. The list of goals pursued by the buyers can be extended further. Each buyer having fully attained all their goals believe in the utmost efficiency of a house. In this vein, Web sites such as Virtual Home Tours (www.hometours.com) offer additional information about houses in the form of a virtual walk-through. Such virtual promenades save both broker's and potential buyer's time and help the buyer to make a decision on whether or not to take an actual look at the house.

Real estate e-negotiation involves process, behavior and substance. The process points to how the stakeholders negotiate (context, tactics, stages). Behaviours refer to the relationships among stakeholders, the communication between them and the styles they apply. The substance points to what the stakeholders negotiate over (agenda, interests, options, agreement).

Legally a real estate's ownership is transferred by giving the real estate's deed to the buyer and closing is usually handled by a third party (e.g. lawyer or the title's company) that both sides trust, although who that is differs from jurisdiction to jurisdiction. The Property Transaction Network (www.theptn.com) is already offering an "Electronic Closing Table" on which the real estate transaction can be completed on-line. This 'Table' provides a secure area in which all transactions participants (i.e. real estate brokers, insurers, title companies and escrow representatives) may safely exchange documents.

At present the developed MLS don't allow for the performance of the following functions: multiple criteria analysis of alternatives (priority, utility degree and market value of the analysed real estate alternatives), negotiations and determination of the most rational real estate purchase variant based on real calculations.

The Real Estate's Market Value and Pollution and Health Effects Analysis Decision Support System (Zavadskas *et al.* 2007) and the Cooperative Integrated Web-Based Negotiation and Decision Support System for Real Estate (Kaklauskas *et al.* 2005) developed by the authors create conditions for e-listing, e-searching, e-evaluation, e-negotiations, and e-execution and above functions. For example, Real Estate's Market Value, Pollution and Health Effects Analysis Decision Support System consists of a Market Value Analysis, Air Pollution, Premises Microclimate Analysis, Health Effects, Voice Stress Analysis, Cooperative Decision Making and Multiple User Subsystems.

1.7.11. Neural networks, expert and decision support systems and their integration

Expert system is a computer program or set of computer programs that contains a knowledge base and a set of rules that infer new facts from the knowledge and from the incoming data and are used to help solve problems in certain areas. Moreover the system performs many secondary functions, as an expert does, such as asking relevant questions, explaining its reasons and the like. The degree of problem solving is based on the quality of the data and the rules. Expert systems today generally serve to relieve a 'human' professional of some difficult but clearly formulated tasks.

Decision support system is an information system that stores and processes information and data from various sources. By using different mathematical and logical models it provides the decisionmaker with the information necessary for analyzing, compiling and evaluating possible decision alternatives, making decisions and effecting the output and storage of the obtained results. Therefore, the decision support system, which can be based on the data accumulated from different sources, should enable consumers to transform a huge amount of unprocessed data into information necessary for the analysis of a particular problem and for further decision-making. DSS provides a framework through which decision-makers can obtain the necessary assistance for decision through an easy-to-use menu or command system. Generally, a DSS will provide help in formulating alternatives, accessing data, developing models and interpreting their results, selecting options, or analysing the impacts of a selection.

Neural network is a method of computing that tries to copy the way the human brain works. A group of processing elements receives data at the same time

and links are made between the elements, as repeated patterns are recognized (Oxford 1996).

Many various-purpose neural networks, expert and decision support systems can be used for investment analysis, investment performance, portfolio analysis, management of investment, comfort zone, land use regulation, real estate development, risk, valuation, real estate transaction, negotiation, financing, etc.

Integration of neural networks, multimedia, knowledge-based, decision support and other systems in the real estate investment has a very promising future in scientific research. Recently, much effort has been made in order to apply the best elements of multimedia, neural networks, and knowledge-based and other systems to decision support systems.

Knowledge-based and decision support systems are related, but they treat decisions differently. For example, knowledge systems are based on previously obtained knowledge and rules of problem solving, and a decision support system leaves quite a lot of space for a user's intuition, experience, and outlook. Knowledge systems form a decision trajectory themselves, while decision support systems perform a passive auxiliary role, though a situation might occur when decision support systems suggest further actions to the decision maker. Calculation and analytical DSS models can be applied to process the information and knowledge that is stored in the knowledge base. For example, some DSS models can be applied to prepare recommendations by referring to the knowledge in the knowledge base. Decision support systems can also facilitate the search, and an analysis and distribution of the explicit knowledge.

Some think that computer (i.e. agent) intermediaries will replace human intermediaries. This is rather unlikely, as they have quite different qualities and abilities. It is far more likely that they will co-operate closely, and that there will be a shift in the tasks (i.e. queries) that both types handle. Computer agents (in the short and medium term) will handle standard tasks and all those tasks that a computer program (i.e. an agent) can do faster or better than a human can. Human intermediaries will handle the (very) complicated problems, and will divide these tasks into sub-tasks that can (but not necessarily have to) be handled by intermediary agents. It may also be expected that many commercial parties (e.g. human information brokers, publishers, etc.) will want to offer middle layer services (Hermans 2000).

Web-based intelligent, voice stress analysis and IRIS recognition systems in property investment field developed by authors in cooperation with their associates are as follows: Real Estate's Market Value and a Pollution and Health Effects Analysis Decision Support System; Cooperative Integrated Web-Based Negotiation and Decision Support System for Real Estate; Innovation Multiple Criteria Decision Support Web-Based System; Multiple Criteria On-Line International

Trade Decision Support System; Loan Analysis Decision Support System; Multiple Criteria Decision Support Web-Based System for Facilities Management; Multiple Criteria Decision Support On-Line System for Construction Products; Sustainable Development Analysis Web-Based System; IRIS Recognition System; Ethical Multiple Criteria Decision Support Web-Based System; Building Life Cycle Decision Support System; Buildings' Multivariant Design and Multiple Criteria Analysis Decision Support System, etc.

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II. REAL ESTATE DEVELOPMENT

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2.1. Land development

"Location, location, location" formula used in the real estate sector only partly complies with the project design (Miles *et al.* 2007). Far and away the location area where a project is bound to be developed is a crucial issue but any impeccable project may well happen to fail only because the location is bad. Together with the location of a land plot, the period of time when the project is developed is of no lesser importance. The need to observe a real estate cycle as well as timely approaching or exiting the market were clearly proved by the crisis on the real estate market in 2008. From this viewpoint, observation over the rental cycles and investment market together with forecasting of effective real estate development are essential for target-oriented decision making regarding investment projects. Anticipation and experience of development are indispensable for forecasting the periods for approaching and exiting the market where major errors are inexcusable.

Apart from location and time, consideration should be given as to the quality of an asset (Conzen, Schäfer 2013). The quality standards are set throughout the project life, from conceptualizing to the construction requirements and project implementation, quality of rental agreements, paying capacity of tenants and asset management (Raslanas *et al.* 2013). This is important for the end product to be sold and for the investment project to be implemented. Thus, real estate development is made equivalent to an increasing and professionally operating investment market. Investment managers are usually very particular about the quality of certain parameters and bring the project on the market only after carefully checking it. Therefore, the formula for a project developer should be as follows: "location, time, quality".

While developing a project attention should be drawn not only to a suitable location and concept but to the right time for investment. The real estate market constantly experiences peaks and troughs of prices both for rent and real estate assets. Such trade cycles originate from the demand-supply situation on the market and the developers may fail to duly respond to such fluctuations. These cycles may vary depending on the region; therefore they should be clearly identified for each individual project. If the cycles are not identified clearly even well-planned and high-quality projects may experience economic failure. Regular forecasting is recommended for the real estate market cycles.

Real estate market cycles:

Phase I. **Revival**. It starts in the lowest point of the cycle. The market experiences excessive supply that resulted from new construction projects or decline in demand over the previous period. Occupancy is at its minimum in the lowest point of the cycle. As free areas are gradually occupied, their market share is diminished leading to stabilization or even increase of rental rates. Finally, the occupancy reaches its long-term average at the market and the growth rate of rental prices is equal to the inflation rate.

Phase II. **Expansion**. The demand continues growing thus requiring additional free areas. As the amount of free area decreases, the rental prices rapidly increase and reach the point where development becomes economically unfeasible. At this stage the demand still outruns the supply as new floor spaces are put into operation with some delay. Supply and demand are in equilibrium when occupancy reaches its maximum.

Phase III. **Excessive supply**. It starts right after the occupancy gets over its maximum (supply-and-demand equilibrium) and the supply starts growing faster than demand. When the area of the commissioned floor space exceeds the demand, the rental prices cease to go up and pace of construction slows down sometimes leading to a complete halt. After the market gets over the long-term average occupancy rate, it will enter Phase IV.

Phase IV. **Recession**. It starts after the occupancy gets over the long-term average with rapid growth of supply and slow increase in demand. The recession rate depends on the difference between the growth rates of supply and demand. After all, when construction and commissioning of new floor spaces slow down or when demand growth rate increases more rapidly than new floor space supply, the occupancy reaches its minimum.

2.1.1. Classification of land plots

Land has a unique and significant importance for the whole system of business and life of people. Land is of special value for human society as it the only dwelling place for all nations and human generations, principal and natural factor of any business sphere directly or indirectly connected with the production of all goods and services (Dietrich, Dietrich 1997). Land differs from other manufacturing resources in that it is not mobile and its amount is fixed. Land is the end resource whereas natural resources can vary with time, management conditions and use. Land exists as a natural product, not a man-made one. The quantity of land plots is sure to vary depending on political decisions, planning purposes and owners' needs. However, the land itself is the end resource anyway. Land is unique in that there are no two identical land plots, therefore we cannot apply analysis methods we use for labour and capital, but we can apply them for land.

A distinctive feature of real estate market is attributable the nature of real estate. In contrast with financial market, securities market or labour market, real estate market has a strongly marked regional character as it is "pegged" to certain location of real estate assets.

The scope and pattern of demand for real estate are guided by the political system of a society, geographic, historical and cultural factors, infrastructure health and availability of potential working places, level of economic development of the region. However, in the context of real estate market we can mention only the uneven and unsustainable development of its individual sectors.

The territorial effect of development lies in the fact that real estate development results in qualitative change of not only the real estate assets as such, but also their surrounding area. In this regard, an advantageous development scenario should be chosen from those available as it is the only case with positive effect (Sternik *et al.* 2003).

Land as a real estate asset can be categorized as follows:

1) *agricultural lands* and other grounds: lands provided for agricultural needs (farm fields, gardens, vineyards, vegetable gardens, hayfields, pastures), other grounds include shrub vegetation, peat lands, gullies, open-cut mines, etc.;
2) *populated lands*: lands included in urban areas, townsites, resort areas, summer villages and rural areas (see Chapter XIII):
   – urban, settlement and rural areas include built-up territories (lands to be developed) with residential, cultural, industrial, religious and other buildings and facilities;
   – *communal lands in cities, towns, settlements and rural areas* that include lands used as transport routes (squares, streets, lanes, passages, roads, quays), for cultural and recreation purposes (parks, urban forests, public gardens, gardens, boulevards, water bodies, beaches), as landfills for unutilized industrial waste, domestic waste and rubbish recycling waste and other lands for satisfying different needs of population;
   – *forested areas and urban forests* that are intended for conservation of landscapes, flora and fauna, environment, for microclimate improvement, recreational purposes, wind and water erosion prevention;
   – *industrial and transport lands* for communication, radio and TV broadcasting, informatics and space communication, power generation and supply, military defense and other purposes in cities, towns, settlements and rural areas. These include lands allocated to enterprises, agencies and organizations for duly implementation of their activities;
3) *nature conservancy, recreational, historical and cultural lands*, i.e. lands of reserves (except for hunting grounds), prohibited belts and spawning-protection belts; forests of protective function; other lands within specially

protected nature areas; natural monument areas (typical or rare landscapes, flora and fauna communities, rare geological formations, rare species of flora and fauna), (Gulak, Bevzyuk 2005);

4) *forested lands*;
5) *water resource lands*;
6) *reserve lands*.

2.1.2. Main characteristics of land plots to be developed

Development of real estate reflects the level of economic development in a country. The real estate assets can be a mode of investment to increase capital. Those people who want to make profit from real estate must have specific knowledge that can help them to make the right and optimum choice. However, not everyone is capable of doing this, as you must possess a broad range of information about investment parameters. Land plots as land development items have certain characteristics. The main ones are given below:

1. Land titles.
2. Intended use.
3. Type.
4. General parameters.
5. Location.
6. Infrastructure.
7. Buildings and facilities (parameters of buildings in the land plots).
8. Legal mechanism for transactions.

Further we give a detailed analysis of the above characteristics.

Types of land plots include:

Unoccupied land plots.

1. Built-up land plots.

General parameters of land plots embrace:

Land plot area.

2. Type of land title.
3. Purpose.
4. Built-up area.
5. Land-to-building ratio (%). Improved planning of land plots and house designs results in increased built-up density without disturbing the privacy of residents and convenience of residences. Increased built-up density is a way of solving the problem of housing affordability in the regions where land plot prices are high. People will prefer a higher built-up density if developers carefully design attractive dwelling communities with higher real estate cost in the surrounding area.
6. Land development rate.
7. Surroundings.

8. Parking spaces and areas that allow maneuvering of heavy trucks.
9. Site surfacing (ground, concrete plates, asphalt).
10. Fencing.
11. Security of the area.
12. Construction possibility.
13. Professional management system.
14. Experienced developer.

One of the most vital characteristics is **land plot location**, including:

1. Distance of cities and populated cities.
2. Geographical location.
3. Distance of highways.
4. Distance of railway terminals.
5. Distance of main sea routes.
6. Distance of airports.
7. Crowdedness.
8. Quality of access ways.

Land plot infrastructure is evaluated by the following parameters:

1. Electrical substation (capacity).
2. Railway line.
3. Loading platform (area, crane capacity).
4. Gas.
5. Steam.
6. Water.
7. Boiler installation.
8. Canalization (type, drain system).
9. Actual condition of communications.

Parameters of buildings in land plots include:

1. Area.
2. Year built.
3. Physical condition of buildings.
4. Number of floors.
5. Ceiling height.
6. Column grid.
7. Number of stairwells.
8. Floor surface material.
9. Maximum possible load per square meter.
10. Cranes (types, number, lifting capacity).
11. Access ramps.
12. Lighting.
13. Presence of office areas.
14. Availability of ventilation system.

15. Availability of fire alarm system and automated fire-extinguishing system.
16. Availability of security alarm system and video surveillance.
17. Availability of optic fibre communications.

Characteristics of **legal mechanism for transactions** of land right registration include:

1. Agreement of sale and purchase.
2. Share sale.
3. Enterprise sale.

Classification of land plots by intended use is given in the Table 2.1.

Table 2.1. Intended use of land plots (Ukraintsev 2014)

Land plot type by intended use	Description
1. Industrial or other specific-purpose lands	Lands of industrial, power-supply, transport, communication, radio broadcasting, TV broadcasting, informatics, space communication, military defense, security purposes or other specific-purpose lands are considered to be lands located in suburban areas. Such lands are used for operating of organizations and (or) operation of industrial enterprises, power supply sites, transport, communication, radio broadcasting, TV broadcasting, informatics, space communication, defense and security facilities.
2. Populated lands	Populated lands are considered lands that are used and intended for building-up and development of urban and rural settlements and detached from the lands of other categories.
3. Agricultural lands	Agricultural lands are suburban lands allocated for agricultural use and intended for this purpose. Agricultural lands include farm fields, on-farm roads, lands containing communications, trees and shrub vegetation for protecting land from negative (harmful) natural, anthropogenic and technogenic impacts, landlocked water bodies, buildings, facilities for production, storage and primary processing of agricultural goods (Sternik *et al.* 2003).
4. Forested lands	Forested lands include lands covered by forest vegetation or uncovered lands intended for reforestation, cutting areas, burnt areas, open stands, failed areas and other unforested lands of forestry purposes (clearances, roads, swamps, etc.). Main intended use of forested lands is forest management: forest growing, reforestation, forest conservation, rational forest utilization, forest protection.

Land plot type by intended use	Description
5. Water resource lands	Water resource lands include lands occupied by water bodies, water conservation zones, lands allocated for right-of-ways and watershed protection zones, hydraulic structures and other water facilities. The main purpose of water resource lands is to prevent water pollution, clogging, depletion, to provide for rational utilization of water resources of a country as well as for other hydroeconomic tasks and interests of people and the country as a whole. Thereupon, legal regime of water resource lands and that of water bodies utilization and protection are interconnected.
6. Lands of specially protected nature areas	Lands of specially protected nature areas include lands of nature conservation, research, historical, cultural, esthetic, recreational and other significant value that were appropriated in accordance with legal acts by federal government bodies.
7. Reserve lands	Reserve lands include state-owned or public lands that are not allocated to individuals or legal persons. Specific features of reserve lands as a land category is that their intended use has not been regulated legally. Moreover, when their specific intended use is assigned (or entitling or enabling document is issued to an entity), reserve lands change their category. A distinctive feature of legal regime is that fact that all reserve lands are state- or public-owned.

2.1.3. Main characteristics of land development

Increase in investment into real estate sphere has resulted in growing demand for commercial construction sites and therefore in active land development. Here the main task is site mobilization before construction works.

Classical land development consists in creating living environment, improving marketability of sites and their investment prospects (Kuksenkova 2007).

Broadly speaking, land development is an activity of social-economic development of land plots and areas by means of planning, designing and constructing industrial, social, engineering and municipal infrastructure (Sternik 2002).

In restricted sense, land development involves activities aimed at improving marketability and investment prospects of land plots, hence increased market price. They include activities ranging from recategorisation and redesignation of land to providing engineering and transport infrastructure and complex development that involves creation of a development concept, general plot plan, architectural concept, etc.

Main components of land development are (Kyultz, Matyushina 2007):

- Market analysis and land development prospects. Study of the available land, including legal aspects of land use;
- Analysis and estimation of an efficient land development scheme, including preliminary calculation of economic feasibility of the project to be implemented on the selected land plots;
- Pre-investment feasibility study, including cost calculation and financial analysis of the project, assessment of cost-effectiveness;
- Registration of land rights, attribution and changing of permitted occupation, engineering, environmental and other surveying;
- Attraction of investment in land development project;
- Urban planning of a land plot, including coordination with general plans of land development, infrastructure analysis, decision making, resources specification, encumbrance coordination, preparation of planning project and concept of a general land development plan;
- Implementation of land development project;
- Common sequence of operations to be performed when designing and implementing an investment and construction project of land development is given in Table 2.2 (Beloborodov 2011).

Table 2.2. Scope of operations within land development projects (Beloborodov 2011)

Project stages	Stage operations
Definition or redefinition of the project	Assessment of the investor's business idea or original state of the project, development of the project concept
Selection of a "high-quality" land plot (area)	Search for land plots to implement the business idea or concept, registration of land rights, preparation of documents and participation on auctions
Preparation of the land plot (area) for the project implementation	Land survey, securing the land rights, attribution and changing of permitted occupation, engineering, environmental and other surveying
Pre-investment feasibility study	Market research, competition analysis, identification of needs, preliminary engineering and economic calculations, investor's budget preparation, assessment of expected financial performance
Urban planning of the land plot	Coordination with general land development plans, infrastructure analysis, decision making, resources specifications, encumbrance coordination, preparation of planning project and general plan concept

Project stages	Stage operations
Engineering and economic planning	Development of the business plan and (or) feasibility study of the project, alternative analysis, scenario modelling, object selection, justification of design choices, development of credit and fiscal policy, customer's budget calculations
Project financing	Development of project financing schemes, justification of banking loans, fund receiver identification, preparation of documents package to apply for the bank loan, loan administration
Attraction of investments	Marketing and financial market operations, preparation of investment proposals, project promotion, sale of project shares
Architectural design	Design project, general plan, architectural design, landscape design
Engineering design	Engineering sub-projects on and outside the land plot (communications, resources)
Implementation engineering	Detailed engineering work
Resource planning	Organization of resource provision of the project, including selection of resource manufacturers and suppliers
Construction	Construction management
Maintenance of real estate	Management of efficient operation of facilities
Sale of the implemented project	Sale of the project at its final implementation

Example. Analysis of a land plot to be developed

1. Description of land plot location. The land plot is located in the central district of city *N* at address: *NN*. The customer has not provided any documents of land plot allocation and use rights. According to the urban planning, the block with the reference land plot is located in the central district close to the city-forming street and is surrounded by the blocks of historically developed layout. One block further, north of the land plot, there are a subway station and a sports complex within a walking distance. North-east of the land plot there is a district park. The abovementioned factors of the surroundings are advantageous in terms of location of the residential area. The land plot of a provisional area of 3.2 ha is of simple geometrical shape. The land relief is characterized by considerable elevation changes over the whole territory, sloping westwards. Minimum and maximum relative elevations are 130.30–140.00 m respectively.

2. Conditions on the land plot. At present the land plot to be developed contains manufacturing and administrative buildings of "ZZZZ" factory, their condition being satisfactory. For reconstruction of manufacturing buildings and their redesignation, an engineering report on their load bearing structure is needed. The land plot includes engineering communications that service the existing manufacturing buildings of the factory. The engineering communications are subject to relocation and reconstruction, thus adding to the project cost. A possible way out is to locate new buildings in the manner that does not require the engineering communications to be relocated. However, this will impose certain restrictions upon the planning of the future real estate project.

3. Analysis of the land plot location. The market analysis is done twice over different time periods – before selecting a land plot and after it has been selected in order to outline the project. The objective of the market analysis before the land plot selection is to identify the market segments where demand is insufficiently satisfied (Frej, Peiser 2004). Original market decisions of land developer are related to the purpose, location and dimension of the outlined project. If the developer does not prioritize the purpose, he has to analyze all market segments: residential, industrial, commercial or mixed use. Real estate markets are heavily segmented, therefore the developer is not able to make any conclusions about the retail sales based only on housing demand. The land developer cannot rely on the assumption that a residential product that is marketable in a certain location will be in demand in the whole district.

Positive factors:

– central location,
– high business activity,
– low population density in adjacent areas.
– good accessibility by transport,
– proximity of underground station,
– high status of location, important urban facilities,
– sports and recreational areas nearby.

Negative factors:

– busy central streets,
– limited accessibility by transport,
– low traffic adjacent streets,
– no house façade facing major roads, limited visibility,
– limited traffic capacity of adjacent narrow streets.

4. Conclusion. Factors influencing the choice of real estate type can roughly be divided into three groups: area and shape of the land plot, location of the land plot, market situation. This chapter featured the factors related to the location of a land plot and its characteristics. Such factors are considered to be the guiding ones. Whatever the promising market, physical features of the land plot

narrow its potential. Alternatively, the land plot location can often put it in a competitive position in terms of commercial real estate, even if the market is forecast to be saturated. Thus, these factors are the primary ones. Based on the analysis of land plot location and its physical features, three main conclusions can be drawn:

1. A land plot may have both positive and negative location parameters that restrict real estate types or enable positioning. The main characteristics here are no house façade facing high traffic roads, central location in the city, restrictions due to the existing buildings.

2. Land plot location is to a greater extent unfavourable for retail real estate. Such real estate is restricted by low traffic in the adjacent streets, their poor traffic capacity, absence of façade and limited visibility. Such location is to a lesser degree unfavourable for office and residential real estate due to the central location, high status of the area, presence of important urban facilities. There are no convincing unfavourable factors for residential real estate.

3. There are no town-planning or legal restrictions on the land plot that may be imposed upon any given type of real estate. The land plot area is appropriate for all real estate types and mixed-use complex.

4. Thus, the most essential restrictions are related to the retail aspect of the real estate asset. On the whole, the factors describe above are most opportune for residential use. There are no factors ruling out any given real estate types on the land plot.

The term of land development may cover a rather wide scope of activities ranging from recategorisation of lands to complex land development. Particularly, the result of land development is primarily an investment product, i.e. a land plot made ready for the construction. It should be note that a land plot is the specific real estate type that can be judged only by the results of state registration. This does not mean that land development is specified for the particular land plot. It is not infrequent that land development is designed for a large area that is then subdivided into smaller parts, i.e. land plots. The fragmentation method is the essential method of land development. In such a case the developer embarks upon the improvement of lands that are parts of a larger territory. As a rule such activities include building of engineering structures – roads, water supply and water disposal systems, power-supply systems, i.e. all systems that today are called engineering infrastructure.

The Chinese experience dating back to early XXI century where there is no land ownership institution, but a perfect market of land leasehold rights. Special development companies purchase land leasehold rights, initiate and design development projects, deal with land improvement and fragmentation, dispose of (transfer) leasehold rights to third parties, including development companies engaged in development of commercial, residential and other real estate. Economic

benefit of such development projects results from the fact that increase in land market value caused by the project exceeds the total of its implementation costs. It means that a development project can be considered successful if the land is used in the most efficient way. This indirectly contributes to increasing macroeconomic parameter – gross domestic product (GDP). In addition, the government is released from funding the land development and moves this function to the market.

To achieve the goal, land developer tackles problems of three types: conceptualization (selection of the most efficient option of the land plot use); legal support to the land plot, including possible recagorisation; engineering and technical arrangements (connection to engineering communications, building of roads and networks, etc.).

Professional land developers focus on full service range, dealing with consulting, marketing, legal services, project management or design as their main services and contracting other companies for other services. Land developers seldom engage in construction works on the whole land area. They implement such activities as site preparation, site design and by-lot sale of smaller land plots to other land developers. It can be assumed that with the government policy of attracting direct investments to the real estate market, in the near future we may expect new companies rendering complex services of addressing legal, financial, organization and coordination issues, i.e. covering all issues ranging from transaction to state registration of land plots and facility commissioning.

At present the only service in demand is recategorisation of land, i.e. changing its status. The process can take one year or longer period for agricultural lands.

Today land development is a cost-effective, highly profitable and investment attractive land business. It involves not only sale and purchase of a land plot but the process of buying the most appropriate and attractive land plot and developing project-compatible architectural plan and general concept. Necessary arrangements should be taken as to establish the required and the most complete infrastructure as well as connection to all communications, gas and water supply, canalization, power supply, etc.

Land development in the real estate market is the most long-term business as, for example, in a large-scale land development the project can run for almost 50 years starting from the project concept to its implementation. This brings to the forefront the issues of land development conceptualization together with legal issues, i.e. registration of land plots, coordination of paperwork, projects, etc. Investments in such land development projects are becoming more and more frequent and attractive. In fact, the investment income resulting from the building of villa communities averages from 40 to 80%. Capital investments in industrial facilities construction are highly profit-generating as well. Rapidly-developing trading networks also require the developed neighbourhoods with

further development prospects. Accordingly, there is a great demand for projects of warehousing and trading facilities. Investments in industrial lands and industrial facilities construction yield many dividends for the owners.

In future, land development will have an enhanced effect on the development and consolidation of land market due to the high cost-efficiency of the business.

The increasing effect of land development is clearly pronounced in the processes of sale and purchase of lands. To satisfy the growing demand of business people working in line with the land development schemes, real estate agencies establish specialized departments engaging in sale-purchase of either land areas to be developed or ready-to-sale areas. Some of them offer for sale partially implemented projects which can be used for further construction on a subcontracting basis or without it (Kyultz, Matyushina 2007).

In western countries it is special companies that deal with land development. These land development companies purchase promising land plots (of a very large area), deal with their legal implementation, construct necessary engineering communications and then transfer then to one or several construction companies.

Land parcelling is a significant aspect of the community development guiding the origination of a community, various land purposes, infrastructure to include: roads, drainage systems, water supply, canalization, utility services, engineering networks (Conzen, Schäfer 2013). Technically, land parcelling involves physical and legal actions to be taken by a developer and aimed at converting idle undeveloped lands into developed ones. Most regulations of land parcelling were subject to improvement and amendments as the foregone regulations impeded development, including proper road building, services provision, proper building density to create well-balanced residential environment.

Today, developers should give special consideration to those impacts that their projects may have on local communities. Even though the projects comply with the existing planning standards, the developers have to provide substantial proofs that their projects will be beneficial for local communities (or at least will have no adverse effects on them), surrounding areas, road traffic, schools, parks and other public infrastructure and what's more the project must have positive effect on taxes. Therefore, the developers must consider the complex relationships between private and public sectors.

The process of land parcelling aimed at the development of idle lands includes three stages (Miles *et al.* 2007): undeveloped, unshaped land; partially developed land (usually divided into land plots of 8–40 ha, having roads and utility services connected to the property border) and developed or parcelled land, divided into land plots for housing construction and commercial land plots of 2–4 ha. The latter are most often used for greening and landscaping projects. The process of converting undeveloped lands into the partially developed ones

differs depending on the location, land ownership rights pattern, capacity of local developers and financial agencies, as well as on the established practices of road building and utility services provision.

Conversion of undeveloped areas into partially developed ones is becoming increasingly popular with large development companies. They prefer to deal with land areas of 80–400 ha that are further divided into land plots of 10–40 ha. The companies create basic infrastructure to include main (arterial) roads, utility facilities, drainage systems for smaller land plots to enable their subsequent partition into construction sites. Usually the main contractor takes construction risks and receives construction income that amounts to 5–8% of all direct costs of construction. The developer's income is usually 8–15% of all costs that makes up additional contractor's income. The developer's income results from the margin between all development costs and capitalized income value of the leased (purchased) property.

The land plots are converted according to three main ways (Code of the Republic of Belarus…. 2014): 1) transfer of boundaries; 2) change of purpose; 3) readjustment of land plots.

Transfer of boundaries

Transfer of land plot boundaries means change of turning points coordinates and (or) land plot area, its cadastral number and purpose being unaltered. Boundaries may be transferred by owners' decision. Private property boundaries can be transferred by an agreement. When boundaries are changed, land plots must be repartitioned (Code of the Republic of Belarus… 2014).

Change of purpose

Land purpose change as a rule aims at more efficient and profit-making use of lands.

Generally speaking, change of land purpose is a labour-consuming and often impossible task subject to resolution by local authorities and territorial planning (Code of the Republic of Belarus... 2014).

Sometimes local authorities receive land purpose change requests from the winners of rent auctions after the land plot has been transferred to them for permanent structure building. For instance, they request to change the purpose of construction a children cafe to construction of children goods' store with office rooms. Such change is considered to be highly problematic (Kapchan 2010).

Readjustment of land plots

A considerable problem of land development is that the boundaries of registered real estate often impose restrictions upon optimum or rational land use or territorial planning. Readjustment often results from the need of building development, road building, construction of engineering networks. Many countries

(Germany, Sweden, Japan, South Korea, Greece) have a special procedure for real estate construction based on administrative reasons called „readjustment" (Land Readjustment in Greece, Germany or Reallotment in Sweden). Readjustment aims at intervening the established environment to create a new and more efficient one.

Readjustment is a way of transferring the boundaries of a previously shaped and registered land plot to form a new land plot according to the *detailed territorial development plan*. For instance, the detailed territorial development plan may require to withdraw some land plots and to readjust them to public property (roads, parks, schools, etc.). Readjustment is considered to be a more efficient tool than land purchase, forced sale, expropriation, etc. Readjustment is regulated by special law. For example, in Germany readjustment of land plots is governed by federal law "On Land Management" and Construction Code. In Sweden real estate readjustment regulations are laid down in Article 81, Law of Sweden "On Real Estate Reallotment".

Readjustment practice of Germany is described below. Local authorities are responsible for readjustment procedures. For readjustment to be done, a special act of readjustment is passed that describes the area to be readjusted and the land plots contained in it. It is brought to the public attention. Based on the act, a project of land reallotment is designed (readjustment plan). If not all land owners accept the readjustment plan, it is enacted by local authorities. Then marking of new boundaries is carried out, termination of rights of the previous land ownership is registered, new land plots and their ownership rights are registered. In case all land owners accept the plan, the procedure is different. A voluntary agreement between all rights holders, investor and local authorities is concluded. Commonly, all land owners accept the readjustment plan because their profit makes up to 40% as compared to the market price of the land plot.

In Sweden reallotment includes the following:

– it is subject to agreement or is carried out by administrative enforcement. Forced reallotment is possible only when a detailed territorial development plan is available;
– it is possible provided it results in a more rational land use. The resulting profit must exceed readjustment costs;
– it is carried out on the basis of a stakeholder's application provided the stakeholder proves the need for reallotment;
– if there are some reallotment options to achieve the set goals, the most cost-effective scenario is implemented;
– it is done by means of withdrawal, exchange, merging, annexation;
– reallotment costs are covered by stakeholders;
– if reallotment affects a leased land plot, the leaseholder claims reimbursement. Withdrawal is governed by an administrative act and involves

expropriation of lands that is beneficial to the city needs. Withdrawal decreases the property in terms of legal provisions which is the territorial development plan.

Exchange of land plot parts is effected by the owners provided newly formed plots conform with their designated use. Exchange is enforced when new plots have prescribed area and proportions. Exchanges are remunerated. Unequal exchanges are compensated by the market cost or by easement services.

Merging is annexation of adjacent real estate to achieve the set goals.

A way of readjusting agricultural lands called „consolidation" is broadly known. Consolidation is usually concerned with enlargement of farm enterprises. The problem of consolidation first emerged in Moldova in the 1990s when land plots in rural areas went private inconsiderately, i.e. by allocating small land plots.

2.1.4. Problems and characteristics of land development

The most significant tasks of lnd developemnt are:

– generation of territorial developement strategy;
– marketing of the area and peculiar features of land plot sale;
– project implementation risks and ways of minimizing them;
– documentation of permitted land plot use.

Territorial development strategy covers the following aspects:

– identification of the most efficient use of the area;
– analysis of the main factors affecting the land costs on the local market;
– project design illustrated by examples of existing projects;
– economic analysis of planning decisions.

Marketing of the area and peculiar features of land plot sale analyze the following aspects:

– supply and demand;
– price policy;
– cadastral boundaries and market zone;
– advertising and promotion techniques.

Main *risks of the initial stage of a* land development *project* are directly connected with the land plot characteristics and include:

– risks related to nonconforming or improper documentation;
– risks related to restrictions caused by negative immediate surroundings;
– risks resulting from the negative development of adjacent areas;
– networks, prospective development plans of major transport hubs.

Main risks of the project development stage are:

– proper selection of a land plot;
– change of purpose and recategorization of lands;
– technical specifications;

– project approvals;
– possible encumbrance;
– first-time-wrong selection of project participants;
– underdeveloped concept and project design;
– wrongly defined proportions of real estate segments;
– insufficient knowledge of special duties and responsibilities of each project participant;
– unavailability of true and objective information.

Main *risks* of land development *project management* include:

– incompetent project management team. As a result, each project participant strives to gain maximum own profit.
– wrongly organized and held tenders;
– unreliable evaluation and pre-requisites of project implementation;
– lack of knowledge of technology and implementation techniques;
– wrong choice of subcontractors;
– misunderstanding of interaction between project participants;
– lack of knowledge of duties and responsibilities of certain project participants;
– improper forecasting and observation of deadlines and total project budget;
– no clear general project implementation plan.

Registration of permitted land use is a complicated stage of land development. The set of actions and their sequence depend on the legislation applicable in the region/area of the land plot location.

Case study. The sequence of actions aimed at alteration of permitted land use is as follows:

1. Resolution on land use alteration by local authorities
2. Land allocation act
3. Development of the investment concept chapter "Environmental impact evaluation"
4. Approval of land allocation act:
   – technical specifications of water drainage;
   – various approvals;
   – geocentre statement on mineral resources availability;
   – act of site study;
   – approval by the District Sanitary and Epidemiological Supervision Centre (DS ESC);
   – approval by the State Sanitary and Epidemiological Supervision Centre (SS ESC);
   – approval by the Ministry of Culture;
   – statement of land value;
   – approval by cadastral chamber;

- approval by the local fire safety authority;
- approval by local traffic police;
- minutes of the meeting of neighbourhood residents;
- approval by rural district head;
- approval by the Local Committee for Land Reform and Land Resources;
- other approvals (if necessary).

5. Approval by the Department of Architecture and Urban Planning.
6. State Environmental Expertise Committee report on land allocation and alteration of land use.
7. Approval of land allocation act by the local authority head.
8. Resolution of land use alteration approved by the local authority head.

Problems of permitted land use registration vary in different regions. For the real estate market to operate with maximum performance, the share of private lands should exceed 50%. This percentage differs depending on a country.

Buildings and Facilities Development is further subdivided into Multifamily Residential Development, Office Development, Industrial Development, Retail Development.

The chapters below provide detailed description of technology and trends of the development types.

2.1.5. Land plot allocation

The significance of various factors of the developed land plot array depends on the end users of the allotted land plots. Main factors of land plot evaluation are given in Table 2.3. Before a land plot is purchased, many physical, legal and other factors are to be evaluated (Frej, Peiser 2004). Among other important issues, the developer should:

1. Make sure all easements are plotted on the plan and all related problems have been settled. The purchase is made after easements agreements have been concluded.
2. Check for water drainage problems, find out the groundwater level that specifies canalization equipment, reservoir and groundwork installation.
3. Check flood maps/flood insurance.
4. Find out the general plan requirements to the area of roads, blind streets and other project requirements.
5. Explore whether third parties can delay or impede the sale process.
6. Make certain that water supply, canalization, gas and power supply systems, telephone communication are available.
7. Find out the requirements applying outside the land plot area.
8. Find out the fees of permit application, tax values and environmental impact fees.
9. Check for the proper planning.

10. Clear up whether all permits necessary for development will be obtained.
11. Make sure the construction company will have all necessary construction permits.
12. Make sure the development company will obtain the building license.
13. Check for environmental problems. If the area has a lake, pond or marsh, the problem must be given consideration, as it may negatively affect the process of application for a building license.
14. Carefully check for the presence of sulphates in the soil that may destroy concrete and stonework
15. Screen the land plot grounds for harmful substances, i.e. radon and uranium compounds
16. Look at the historical photos of the site that may contain some information or evidence of contamination by toxic substances
17. Screen the land plot for landfill sites that may contain explosive gases, e.g. methane
18. Explore the land plot for smoke, evaporation and smells at different times of the day
19. Visit the land plot regularly.

In all cases developer must carefully assess the environment a land plot is located in. What is general political climate? Will the public resist new development processes or support them? Is it possible to get approval of the planned development by the neighbourhood? Are there any shops, school and parks in the vicinity? If schools appear to be a problem to solve, what is their reputation? On inactive markets favourable purchase conditions are very probable. If the number of sellers exceeds that of buyers, the sellers are likely to allow the buyer more time to explore the property without asking for an advance deposit. On active market sellers are more secure in the transactions and always ready to show the property to other prospective buyers. Therefore developers must respond to the current market situation in the proper way.

2.1.6. Market analysis after land plot selection

After a land plot has been selected, the developer should once again carefully analyze the target market of the project to be developed. Specific characteristics of the selected plot as well as any changes in the economic climate as a whole can set the price which is different from that identified during preliminary market analysis carried out before the land plot selection. At this stage the analysis should focus on location, neighbourhood and facilities. For instance, the initial target group of the developer were buyers selling their housings at 300,000–400,000 EUR. If the property sales continually met this price range, the developer will follow the same price-forming policy, even if there are some other

Table 2.3. Land plot evaluation factors

Market location and competition	Land plot peculiarities	Legal restrictions
Location and neighbourhood: · Distance to the most significant city points · Quality of the environment · Existing housing/ other buildings · Schools and churches · Parks and recreational infrastructure · Facilities · Shopping · Social services **Area and shape** **Accessibility and panorama**	**Land plot peculiarities:** · Sloping · Vegetation · Levelling or gravelling needs · Existing buildings · Hydrological and draining conditions · Toxic waste · Soil properties · Fauna and endangered species · Specially protected nature areas **Legal restrictions:** · Easements · Private easements · Disposal restrictions · Liabilities	**Engineering communications:** · Water supply · Canalization · Power supply · Gas · Telephone · Cable TV · Planning and control · Development climate · Charges · Environmental taxes · Future seizure · Future road construction · Necessary permits / licenses · Approval / opposition by local residents · Licensing procedures

competing developers on the market. However, if the developer determines that the market is already saturated, he can change the policy and sell within a lower price range. He is absolutely free to sell at higher prices if the product meets the market needs and demographic situation of the region is favourable. The market analysis aims at assisting the developer:

1. To make physical plans (detailed plans) identifying specific target market, i.e. land plot size and shape, facilities and other essential aspects.
2. To take up a loan and submit necessary documentation.
3. To employ constructing companies and development subcontractors.

The analysis of the market potential aims at guiding the developers about the best market for the land plots. It should cover the total number of land plots grouped by size and shape that the developer is able to sell within one month. The analysis should identify total demand for residential property as well as its local supply. Demand and supply of the specific product and of the local submarket are dependent on the parameters above. Thus, the end result of the market study must be a planned amount of units showing how many monthly sales can be expected for the given product at the given selling price. For instance, it is assumed that there is demand for detached houses (150 m^2) at the price ranging from 300,000 to 400,000 EUR. The submarket supplies 200 houses annually (16 houses per month), two land plot massifs competing with

each other. Approximately 5 sales are expected per month provided each massif has its own market segment in the total demand. This figure should never be unsubstantiated and conflicting with the sales figure, moreover, we shouldn't expect the sales growth rate to accelerate. Most often demand doesn't match well the sales of the developed product. Many prospective buyers are reluctant to purchase it because it is too costly, does not match their taste or for some other reasons. Therefore, planning of the sales growth rate should be factually accurate. If statistics shows that other developers sell 2–3 products monthly, a new developer is unlikely to sell more. It is common practice for constructing companies to buy more than just one site. The sales usually amount to 4 or 5, sometimes even 50–60 sites depending on the project type, the constructor's capacity and market conditions.

At the market analysis stage the developer must (Conzen, Schäfer 2013):

1. Outline the market location (geographical area on which the project is to be developed should be large enough to cover a whole city district).
2. Identify the products on the competing markets (The market outline should not be too narrow to avoid competition and to have the supply in mind).
3. Determine sales rate or capture rate. The massif sales rate must account for the total demand on the market as well as for other massifs. Sales rates that are 5% higher than other projects are not likely to be feasible in large cities.
4. Account for employment and absorption rates. (The planned local demand must be justified by employment planning and historical absorption rates. Unreasonably high sales rates as compared to the historical figures always generate doubts).

The land plot development is a transitional factor. The shortage of housing can be accompanied by oversaturated market of land plots.

2.2. Residential development

As well as other residential markets and real estate market as a whole, the apartment market is of exceptional cyclical nature (Galinienė *et al.* 2006). Building sector is governed by national and local conditions to include local people's attitude to apartment houses as well as the market situation. Commonly, low cost of borrowing causes intensive building of apartment houses while high cost of borrowing (10% and over) slows down the building rates. The apartment house construction is also heavily dependent on demographic situation. Much as the total demand for apartments relies on the economic growth rate, the demand for certain apartment types depends on the population composition. Prevailing population aged 20–35 years and representing the main share of workforce will

call for increased demand for apartment houses. Is the society is dominated by people aged 40–50 years, the demand will go down. If the population is dominated by more mature people, demand for other housing types will increase that are more suitable for elderly population and their daily needs. These factors give new opportunities for developers.

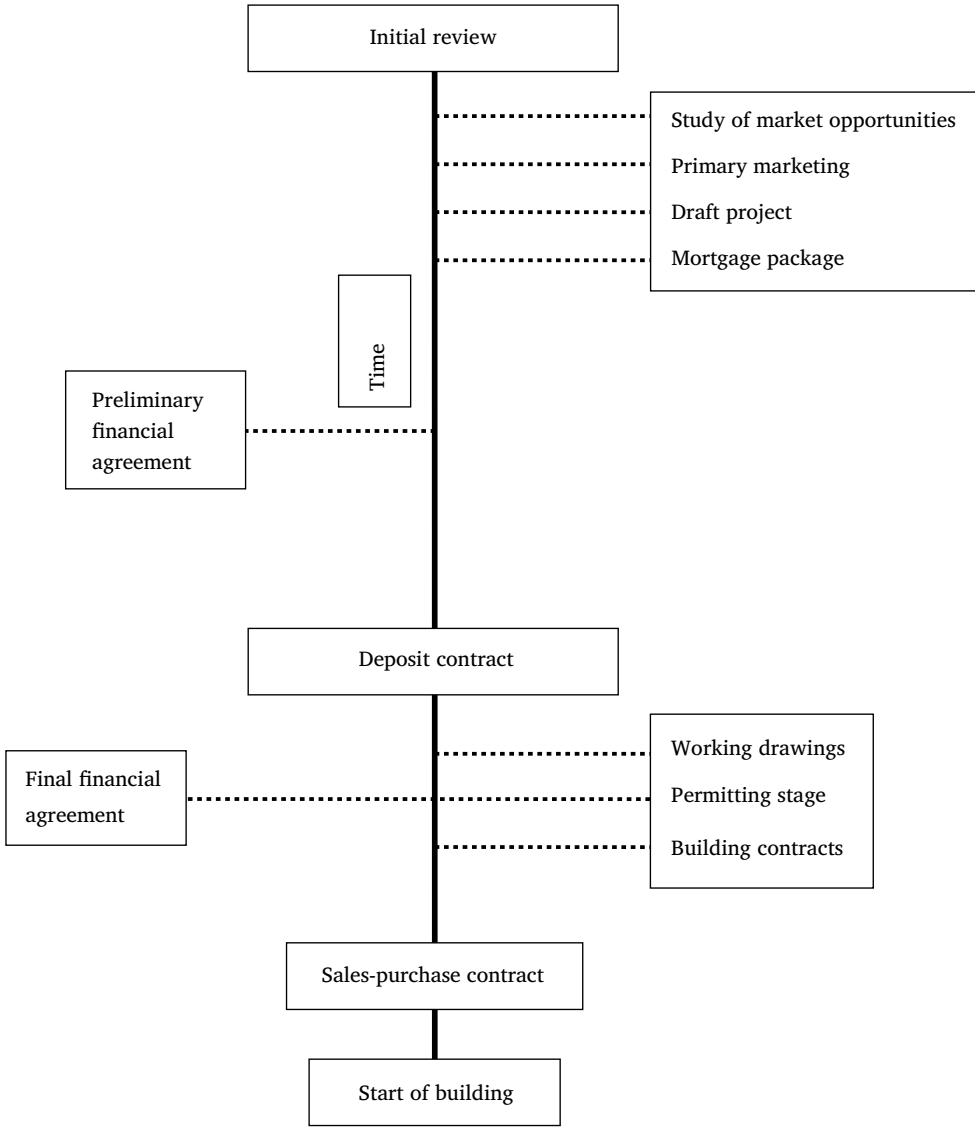

Figure 2.1. Order of pre-building events

The feasibility analysis of the project includes several tasks and activities that must be implemented before the project is started. When doing the analysis, the developer needs additional information that is essential for further project life. The project can be turned down at any stage of the analysis thus reducing the analysis cost itself and land preparation costs. Positive information usually justifies further costs that are aimed at obtaining further information. The feasibility analysis includes four aspects:

1. Market analysis;
2. Land plot selection/technical specification;
3. Approval of project documentation;
4. Analysis of financial feasibility.

Ideally, developer does not register land rights before the site is ready for development. However, the seller is most often not willing to wait for a long time (Kaklauskas *et al.* 2012). The order of events is shown in Figure 2.1. The developer is not to delegate to the architect the task of doing marketing research. Project characteristics such as apartment types and size, additional facilities must be based upon detailed and thorough study of the market, tastes and preferences of the target market stakeholders. The market analysis results must match the developer's capacity to implement the project.

Identification of the absorbed market segment must be very critical. Market share of over 2.5% is considered to be highly ambitious. Certainly, in small towns developer may occupy 50% of the market whereas for large cities the share is not likely to exceed 5%. On an unfamiliar market developer can estimate his potential market share based on other developers' experience in the same region (the same product and sales promotion campaign).

2.2.1. Residential property classification

There is no uniform residential property classification. It is common to categorize residential property by classes (The Real Estate Developer's Handbook 2007), generally conceptualized as elite, business and economy classes. Classification of such residential property by main parameters is given in Table 2.4. Residential property classes are covered by Table 2.5.

Table 2.4. Parameters of residential property categorization by elite, business and economy classes (Uniform classification methoodology... 2014)

Parameters	Elite class	Business class	Economy class
Location	Historical centre, ecologically safe prestigious areas	Any area	Any area
Building technology	Monolith/brick	Monolith/brick	Panel/monolith
Building surrounding grounds	Fenced	Fenced	Fenced/unfenced (at the residents' initiative)
Safety systems The standard of safety systems, video surveillance, etc. depends on preferences and financial capacity of residents	Yes	Yes	No/yes (at the residents' initiative)
Underground parking	Yes (one or more parking space per apartment)	Yes (one or no parking space per apartment)	No (parking spaces on the surrounding grounds)
Interior design of foyers, entrances, public spaces	High-quality (high-quality materials are used)	Improved quality (sound materials are used)	Standard quality (domestic materials are mostly used)
Lifts	Tisson, Kone, Mitsubishi, Otis, Schindler	Mitsubishi, LG, etc.	Domestically produced (KMZ)
Apartments per floor	2–3	4	5 and more
Apartment size (rooms/m2)	2/90–140, 3/130–160, 4/160–190	2/60–80, 3/90–130, 4/110–150	1/35–50, 2/50–70, 3/70–100, 4/100–130
Daylight area	Improved (incl. possible stained glass panels)	Standard	Standard
Ceiling height (m)	3–3,5	2,8–3,10	2,7–3

Table 2.5. Categorization of residential property by housing classes (Classification of housing in Russia... 2013; From economy to elite class... 2012; Russian market of exclusive real estate... 2008)

Housing class	Construction type	Location	Technical specification and consumer properties
Economy class (standard houses)	panel; brick	Bedroom suburbs	Mass-produced houses (improved series) built by standard projects without personalized apartment layout
Business class	brick; monolith; brick-monolith	Suburban areas	Renovated old houses and neo-classical Stalinist houses
		Commuter belt	Apartments of personalized layout, terraced houses
Comfort class	brick; brick-monolith.	Historical centre	Renovated old houses of improved architectural concept and space and layout design, high-quality service, building materials and engineering characteristics
		Within historical centre	Houses of improved architectural concept and space and layout design, high-quality service, building materials and engineering characteristics
Premium class	brick; brick-monolith	Historical centre	Houses of improved architectural concept and space and layout design, high-quality service, building materials and engineering characteristics, without parking
Luxury class	brick; brick-monolith	Historical centre	Houses of improved architectural concept and space and layout design, high-quality service, building materials and engineering characteristics, with a magnificent view of water bodies, architectural monuments, etc.
Exclusive class	brick; brick-monolith	Unique historical centre locations	Clubhouses of tailor-made architectural concept and space and layout design, high-quality service (full infrastructure package), building materials and engineering characteristics

2.2.2. Specific issues of residential development

When the land plot to be developed is selected, special focus should be made on the environmental situation of the area. The prestige rank, social infrastructure density, transport accessibility of the centre and other districts of the city are also of crucial importance (Pertsovskiy 2008).

2.2.2.1. Land plot selection

Ideally, the developer conceptualizes a project and then starts the process of land plot selection to implement it. The worst development scenario is when the land plot is owned by another developer. Even though the ownership of the land plot is not sufficient to start the development, such land plot is to be considered if it is owned by the developer. Every land plot is capable of being developed for one or another reason. It is the developer's challenge to find the most optimum and best development solution that will add to the land cost.

The success of a real estate development project is often believed to depend on three factors, i.e. location, location and over again location. This issue has many aspects. Location can be characterized by macro- and microfactors. Macrofactors include distance from large city centres whereas microfactors are adjacent neighbourhoods. In the long term the real estate prices depend not only on macro- and microfactors but also on their changing with time.

Both macro- and microfactors of the location affect the development of apartment houses. Microfactors indicate the city locations where apartments will pay back in the most efficient way. Macrofactors show city locations of the greatest long-term capacity to maintain and increase the market price of real estate, i.e. distance from commercial streets, city centres and suburban employment centres, large development corridors, healthcare centres, regional shopping and leisure centres, parks and recreational centres. Microfactors show how the land plot is located in terms of its adjacent neighbourhood, i.e. distance from major roads and highways, schools, parks, shops, kinder gardens and healthcare centres (Raslanas *et al.* 2010a, 2010b). Ideal conditions are when the land plot can be seen from a major road provided there are privacy, feeling of safety and low noise level. One of the most important features of a successful developer is the ability to pre-anticipate changes in the city structure. His forecasts may be based on thorough market analysis, his own intuition, luck or combination of the above. Successful developers must be sensible of the dynamics in the selected location. One the keys to this success is related to the welfare of cities or towns where they plan their development projects. If the public service level falls in the city, the importance of the real estate markets will inevitably decline as well. Successful developers are aware of their dependence on physical and financial conditions in the city where they develop their projects so many of them are active contributors to public life. You need a life to understand all the aspects of the location that over a certain period of time affect the cost of real estate market. Main components of the location are trends of public investment, private investment, planning, demography and personal priorities. The change rate in most US cities is low, i.e. 30–50 years between peak and trough (Miles *et al.* 2007). But this rate may be higher in badly designed and developed locations and the cycle reduces to 15–20 years after the construction has finished. The real

estate prices in some locations may grow not only for the reasons related to the location itself but to shopping opportunities, open area availability, other facilities as well as to private investment in renovation and improvement of private property. Characteristics of adjacent areas also affect the use of undeveloped land. If the adjacent areas are matched, this can make the suggested apartment house project more attractive. In case they aren't matched, developers must proceed in a very careful way. For a long period of time it was common practice to build high-density residential houses close to commercial and industrial areas. In this way a buffer zone was created against locations of detached houses. This being the case, the apartment houses locations have the winning position due to their proximity to major roads, busy commercial areas and job centres that are needed for the densely populated areas. In their turn, terraced houses often serve as a buffer zone between apartment houses and detached houses in less densely built-up areas. Recently such planning practice gives rise to more and more doubts. Self-management authorities more often suggest that the development plans integrate lands of various uses instead of disintegrating them. This trend is very obvious in flexible land regulation and management when planning contains mixed-use zones. Such planning is considered to be proper one and makes it possible to effectively combine lands of various uses. As a result such planning is more remarkable, efficient and attractive than traditional development.

A good site for apartment house development is the site with a positive synergetic effect from adjacent land plots. For example, an apartment house site that is located in a developed or developing commercial suburban centre is comfortable for its residents due to its proximity to shopping and business centres that can be easily accessed by car or on foot. Besides such an apartment house site may prove to be more customer-attractive due to good neighbourhood connections. The land plot price is sure to be higher if the location is good but these costs are justifiable, especially for high-class apartment houses. When the apartment house site is selected, real estate developers should seek for the land plots with positive synergetic effect from neighbour lands and avoid the land plots where various land uses are not acceptable. To match the land uses, the developers must be well aware of their potential responsibility for building houses in close proximity to the areas of discordant and conflict land uses. The locations adjacent to gas, oil or fuel reservoirs should be avoided. Fire safety should also be taken into proper consideration in forested or fire-hazardous areas. As a rule it is self-management authorities that are responsible for residents' safety, however, in such cases the developers should carefully consider their own safety when analyzing non-matching neighbouring land plots.

The optimum land plot size depends on the local market conditions to include: rental taxes, permissible built-up density and some additional services. For instance, a developer intends to build an apartment house which he may lease

out within 12 months upon the completion. If 15 apartments can be leased out per month (180 apartment per year) and the density of the apartment houses is average (60 apartments per 1 ha), the ideal site area will amount to 3 ha. The land plot area is also influenced by the property management policy. Although the optimum number of apartments varies with each project, most developers consider 150–200 apartments to be a minimum amount to maintain full-time housekeeping staff. Therefore the developers seek for larger areas where they can accommodate sufficient number of apartments. In case it proves impossible to find the area for 200 apartments, a viable solution is to build several smaller apartment complexes within one project.

The larger the land plot area, the greater the project capacity. A narrow land plot makes it impossible to park cars in two rows with a separating line or mixed parking lines that would greatly increase the project efficiency and decrease the project costs. On the other hand, deep land plots require a bypass road or expensive space for fire brigade maneuvering.

When evaluating accessibility of the construction site for the residents the developer has to answer a number of questions:

1. How will future owners or tenants access their residences? What will make the site more or less attractive for the people coming there? i. e. what will people see on their way to the site?
2. How will guests access the site? Is there left-hand turn from the roadway? Is it possible to obtain necessary permission to make a separating strip or to cross the roadside?
3. Will the available transport network be able to bear increased traffic as a result of new development? Will new residents be able to easily leave their dwelling location?
4. Are traffic jams likely to occur during “rush hours”?
5. How much will it take the dwellers to get to work, school, shops or recreational places?
6. Are roads and streets planned to be constructed?
7. Do available streets meet the type of the planned development and requirements? Generally high-density areas with heavy traffic require a departure to highways or major roads whereas low-density areas may require a departure to small side streets.

Good visibility of the land plot is crucial for the project marketing and rent (sale) opportunities because if future residents have not seen the project they may not know about it. Developers can improve the project visibility by several ways, including development tools, landscape properties, bright colours, outdoor signs, night illumination (especially façades). The goal is to create a striking exceptional project.

Development of apartment houses opens up multifold opportunities to use physical characteristics of the land plot compared to other development projects (Kaklauskas *et al.* 2012). Developer of apartment houses to a lesser degree depends on slopes, size and shape of the site because the foundations of apartment houses have smaller area and may have different profiles as compared to office or industrial buildings. Still the developer has to thoroughly analyze all possible features of the site, including slopes, geological conditions, soil, vegetation and hydrology.

Hill tops and sties offering attractive panoramic views always draw the developers' attention. Slightly sloping areas are generally preferred contrary to the straight or flat ones. Slopes make it possible to create more attractive projects, e.g. duplex apartments or varying roof slopes.

Sloping landscapes give the possibility of reducing the amount of ground excavated when building split-level parking spaces in high-density built environments. The construction costs increase considerably if sloping exceeds 10%. Sustaining walls, special bearing parts and other reinforcements of the house foundation may result in increased construction costs and time. Development of flat sites may also involve additional expenses. Canalization networks must be located on sloping sites to provide the required pressure in them. If the relief is flat or some part of it is located below municipal drain connection point, a pumping facility has to be installed.

The site also requires engineering and geological survey. If a river flows through the territory or there are wetland spots on the site, the floodplain must be surveyed. Stagnant water is an indicator of an underground water source which has to be spotted as part of the site may prove to be unsuitable for construction works. Ground conditions as well as floodplains can also create problems. Even if the land seems to be clean, the developer must have geological survey of the ground done before buying the land plot. Good ground, e.g. sand clay, is a medium water conductor. Clay soils expand and compress with water that may cause foundation cracks. Grounds of low water conductivity lead to drainage problems.

Vegetation is a useful indicator of soil and water conditions. Tall vigorous trees are exposed to various dangers. High pedestrian traffic or cars parked under trees may cause setting of ground and eventually kill the plants. The trees survived during construction may later die because of root damage of insufficient water.

Marketing targets individuals of certain wealth. Such features as balconies, loggias, bay windows should be mentioned as architectural features. Taking into consideration the layout specifics, the developer must arrange the floor space into smaller blocks (separate apartments) in the way that offers a compromise

between maximum usable area and share of public spaces that is specified by the given class of housing.

Case study. Housing development project

I. Main project characteristics. The project features design and construction of a residential complex as a part of the built-up environment in a residential district of the city XXXXXX. The construction is planned at the site of 19,726.3 m^2 categorized as settlement land.

The residential complex construction will yield the following commercial area: 76,853 m^2 (including 47,578 m^2 of housing area, 22,733 m^2 of office and shopping area, 542 m^2 of storehouse area and 6,000 m^2 of car parking area). The projects specifies complex monolith-brick and brick building with state-of-the-art heat-insulating and finishing materials. The customers will be offered 22 types of apartments (one-, two- and three-room) ranging from economy to premium and elite class. Housing area and non-residential premises are arranged in a locked protected space. The yard of the housing complex will have children playgrounds, a kindergarden, a 700-space parking. The project specifies eight sections of varying number of floors (from 12 to 25 floors).

Urban-planning impact of the project in the city built-up environment is defined by central location in the city XXXXXX. The project is developed in close proximity to a major highway of republican status.

The relevance of the suggested housing complex project is proved by the fact that the city XXXXXX has no complex built-up areas that would match the modern living standards. Today, houses, office buildings, shops are built on small unoccupied sites close to old and slum dwellings without regard to the surrounding infrastructure. The housing complex project aims at provided the quality of life and property that are important needs today.

II. Competitive strengths of the project. Competitive strengths of the project are:

1. Unique location of the future housing complex (geographical centre of the city XXXXXX, convenient road junctions, good prospects of future infrastructure development).
2. Building quality (monolith-brick and brick building technology, free layout of apartments, modern lifts).
3. Surrounding grounds (secured and developed area, closed inner yards, kinder garden, customized landscape architecture; the area is connected to the traffic infrastructure by driveways and pedestrian ways).
4. Integrated system of electronic monitoring and management of heat, power and water supply, security, lighting, etc. that improves the efficiency of all vital functions of residential and non-residential spaces, parking spaces and reduces maintenance costs.

5. Complexity of the built environment (due to the developed minfrastructure the housing complex will be a harmonious whole).

III. Social importance of the project. The project is of vital social importance. It aims at solving housing problems of the city-dwellers, enhancing their comfort and safety as well as improving the city's architectural look.

IV. Sale strategy of the project yield. When modelling profit from project implementation, stage-by-stage selling of the housing area has been planned. To optimize the payback period, implementation time and costs of loan repayment, selling of residential and non-residential premises has been planned as advance selling, i.e. full-cost payment by the buyers before the housing complex is commissioned. Selling of residential and non-residential areas (shopping, office, storehouse areas and parking spaces) of each property usually starts two months before building and installation work is started. At this stage resettlement of residents has finished and the construction site has been prepared which make it possible to optimize the starting selling prices. Selling of areas is as a rule completed in the month of commission the property.

Usually main contractor takes construction risks and makes profit from construction work amounting to 5-8% of direct construction costs. The developer's profit usually makes up 8–15% of all costs that supplements the contractor's profit. Developer's profit results from the difference between all development costs and capitalized value (market price) of the leased (sold property).

2.2.2.2. Renovation of apartment houses

Renovation of apartment houses is one of property development types. Most old apartment houses do not meet modern challenges of the cities and city-dwellers. Most old apartment houses have defects which are typical of a certain construction type and cause degradation of the operational properties. Such defects may also result in other defects that reduce the life cycle of the building.

Heat insulation of large-panel houses enclosure is not sufficient therefore they suffer from considerable heat losses and low indoor temperatures. Thermal performance of certain enclosures in such houses is 1.6–5.85 times below the established standards. Very often no proper attention is paid to housing improvements in apartment houses massifs, so a tendency of degradation of housing environment can be observed. Parking spaces are scarce, so cars are often parked on children's playgrounds, foot walks, green lawns. Hard landscaping is extremely bad, many benches are in a poor state, there are not enough of them. Most children's and sports grounds are in improper state. Foot-path paving is in a state of disrepair, i.e. paving slabs are broken, paving and borders are not adapted to disabled people. Bicycle track net is not developed.

Renovation of apartment houses is aimed at cutting electricity bills and at maintaining the building. Besides, it is geared to improve safety, comfort, aesthetics as

well as to increase the market price (Martinaitis *et al.* 2007). However it should be done according to the principles of harmonious development. It is the priority goal of urban planning to create conditions for ongoing, socially and economically motivated improvement of the quality of life and for lessening of territorial differences. Building sector is tightly linked to social, economic and nature-conservation spheres. Electricity needs are increasingly growing in in the world making this one of the main reasons for harmonious renovation of buildings.

When evaluating the renovation of apartment houses, particularly energy-saving solutions, their future market price escalation is not taken into consideration. Experience has shown that modernization of such units as local heat supply unit, renovation of heating system and its balanced state is a cost-effective way of energy-saving. However, weatherization of walls, windows replacement, roof renovation and other similar operations are usually not cost-effective (very often the payback period is over 20 years) as they require considerable investment although they help energy-saving as well. Frequently, renovation is considered beneficial only in terms of energy cost reduction, nevertheless these measures also aim at general improvement of building structures and at increasing life of the whole building. This renovation spares future maintenance of these structures and future investment that would be inevitable otherwise. Such matters don't make it possible to provide any formal foundation (when seeking bank loans) for a widescale renovation (improvement of physical, energetic and architectural conditions).

Territorial priorities of renovation of apartment houses are governed by city strategic plans, state of the houses and their surroundings. Generally speaking, the policy of renovation of apartment houses is aimed at:

1. Energy cost reduction by 50%.
2. Increase of market value.
3. Improved state of buildings, increasing their life (by average 30–40 years), conservation of old houses fund.
4. Improved comfort and quality of life.
5. Avoiding future costs and investment to maintain the state of renovated building structures that would be inevitable in case of future wear of the structures.
6. Improvement of architectural features of house façades and their adaptation to the surroundings.
7. Improved attractiveness of residential areas.
8. Bringing in new residents or retention of medium-class residents.

If apartment houses do not meet modern requirements, a dilemma often occurs what to do with them, i.e. to demolish to renovate. It is claimed easier and cheaper to prevent the deterioration of the house by allocating adequate funds thus increasing its useful life until renovation (Zavadskas *et al.* 2008).

In terms of cost, it is unadvisable to develop such renovation packages that result in the situation when the value of renovated apartment is equal or higher than the value of new apartment in the same area. The difference between the market value of 1 m^2 of newly built apartment and the value of 1 m^2 of old apartment as well as cost of renovation will determine the size of renovation investment package. Therefore renovation efficiency in terms of market value will indicate the following market value rate:

$$MVR = \frac{a \cdot (M_{vn} - M_{vo})}{C_r}, \tag{4.1}$$

where M_{vn} – market value of 1 m^2 of newly built apartment, M_{vo} – market value of 1 m^2 of old apartment, C_r – renovation cost, α – coefficient of the residential area where renovation is planned.

Before renovating a certain city district, it is necessary to analyze the value of new and old apartments, renovation costs, actual conditions of the houses. As a result of this analysis, an investment package is chosen where renovation costs are lower than energy-saving costs and added market value.

Today, large-block houses show considerable wear and do not match modern requirements. Non-renovated houses can become a social problem if middle-class people move out of them in future. So, these houses need a complex renovation. Renovation of one house will only reduce maintenance costs of residents, but will not improve their standard of life. Complex renovation of a residential quarter of a group of houses will give better results in terms of quality, aesthetics and social dimension.

Although residential districts contain standard houses, all of them have their own identity due to various nature landscapes, different architectural ideas of developers. When renovating the houses it is important to conserve and enhance the identity of separate districts with regard to natural surroundings, urbanistic idea and current house designs. It is essential to develop 2-3 renovation ideas for the houses of all standards. This will reduce renovation costs as new design projects will not be necessary, standard details can be used to conserve a unified image of the district together with conceptual architecture of the house and its style.

Several façade finish choices are available for external weatherization off buildings to include: decoration plaster, façade panels, ceramics and iron panels. House renovation includes such measures as roof weatherization, new insulation, new roofing. Building of a usable roof storey would improve the house architecture, add to the residential space which could be sold thus partly compensating for renovation costs.

Other means can be used to achieve different looks of houses, residential quarters and areas. Such means include colour, annexes, mansard roofs. Complex

colour scheme of façades will create identity of a residential quarter, so separate design projects of colour schemes should be developed for several houses or residential quarters.

Radical alterations to apartments in large-block apartment houses is impossible because spacing of exterior and interior bearing walls is too small and the walls cannot be broken. Renovation should also embrace stairways, stair platforms, canopy tops, entrance doors, Renovated or new canopy tops, entrance doors and balconies would become essential highlighting features of an apartment house.

An important component of a high-quality house is improved surrounding grounds. Thus, when renovating a house, the surrounding grounds should also be renovated including foot paths, parking spaces, children's playgrounds, bicycle tracks, sports grounds, benches, trash bins, lighting. The above listed problems, drawbacks and defects necessitate measures of house renovation and surroundings improvement. The following renovation measures are possible:

- New waterproof roofing.
- Additional roofing and water proof roofing.
- Sloping roofing (instead of flat roof) for new apartments on the usable roof storey.
- Fixing the unsafe conditions of balconies
- Windows replacement.
- Entrance doors replacement
- Glassing of balconies.
- Repair of wall panel joints.
- Weatherization of end façades
- Weatherization of all walls.
- Reconstruction of heat-supply unit, installation of autonomous automated heat-supply unit for heating and hot water supply.
- Balancing of heating system by installing balance valves on heating system pipes.
- Reconstruction of heating system by installing collector heating system.
- Replacement of pipes of water disposal system.
- Replacement of wiring on stair platforms and other public spaces.
- Improvement of surrounding grounds.

To assess preliminary investment and their cost efficiency, renovation measures packages are developed (small, medium and large investment packages, "basic" package) and calculations are made for different types of apartment houses. Small investment package is intended to replace unsafe and badly deteriorated building structures and systems, their reconstruction and repair. This package is attractive because of rather small investment; however the renovation measures will not considerably improve thermal characteristics of the building

enclosures (only doors and windows) and architectural aesthetic look of the building (only due to windows replacement). Other disadvantages of this package are the preserved imperfect heat consumption records (based on the apartment area) and inability to regulate the heat intensity in apartments.

Medium investment package is geared towards energy saving and high cost efficiency. Individual heat consumption metering and regulation of heating encourage residents to save heat energy and energy saving can be impressive depending on their saving skills. The package also foresees small measures of surrounding grounds improvement. Still the package does not considerably improve architectural aesthetic look of the building, house walls (except for end façades) don't meet modern standards. The system of individual heat regulation and heat metering has some drawbacks with monopipe heating system:

– heat regulation can negatively affect heating in edge apartments;
– metering devices do not record absolute heat consumption – heat consumption is proportionally shared according to the readings of the meters in apartments;
– repairs or breakdowns in one apartment block heat supply to other apartments;
– no possibility to heat individual apartments until the heating season has started.

Large investment package provides high-quality house renovation: house enclosures meet heat conservation standards, the heating system is technologically perfect (accurate recording of heat consumption, possibility to heat individual apartments or turn off heat supply irrespective of the heating season, repairs or breakdowns in one apartment don't necessarily block heat supply in the whole house). Cost effectiveness of the renovated house matches cost effectiveness of new apartment houses. However the large investment cannot be made by all residents. The package is mostly intended for prestigious residential districts where sloping roof is built up thus creating usable roof storey with new apartments that can be sold and thus reduce the cost of investment package.

"Basic" package provides building enclosures that match heat saving standards, mechanical strength and durability of structures, more advanced heating system and individual heat consumption records.

One of the objectives of the city strategic development plan is to encourage housing construction, renovation and development of outdated residential districts and apartment houses, investment in renovation and new construction, development of design projects of apartment houses renovation and energy-saving measures. Territorial priorities of apartment houses renovation are governed by strategic development plans and conditions of the houses and the surroundings. The renovation priorities may differ for different residential districts as they depend on the conditions of the houses and their surroundings. The

renovation of apartment houses should be accompanied by the improvement of the surrounding grounds. The city strategic development plan highlights the importance of improving the city arrival places, its centre and development of certain areas to enhance the international competitiveness of the city. The objectives of the strategic plan are the limiting factors for attaching renovation priorities to certain locations. Therefore zoning of the environment should be brought into view when renovating the buildings. The renovation should be carried out by territorial principle, i.e. renovation priorities should be set and complex modernization of the built environment should be done: renovation of buildings, improvement of the housing environment. These activities will result in enhanced attractiveness of residential areas, increased market value of land, private investment in renovation.

The preparation activities of renovation include:

1. Preparation survey.
2. Identifying the area to be renovated.
3. Setting of renovation objectives.
4. Urban planning.
5. Discussion of future renovation.
6. Making of social plan.
7. Preparation of certain construction activities.

When choosing a rational territorial scenario of apartment houses renovation, the COPRAS method is recommended. The method was used when setting the renovation priorities of the city of Vilnius (Kaklauskas *et al.* 2005, 2006).

Based on MVR calculations for different types of large-block apartment houses of Vilnius and different renovation packages, three renovation groups were identified:

1. Group one included the districts of Antakalnis, Žirmunai and Virsuliskes that required large investment packages.
2. Group two covered the districts of Fabijoniskes, Karoliniskes, Pasilaichiai, Pilaite, etc. These districts were offered medium and "basic" investment packages.
3. Group three included non-prestigious districts (Paneriai, Vilkpede, etc.) where small investment package was recommended.

2.2.3. General classification of commercial real estate

Commercial real estate emerged only with privatization of enterprises. The sector of commercial real estate is much smaller than the residential one, so the number of transaction is accordingly small, although commercial real estate is considered to be very attractive all over the world. It should be noted that by far the most prevailing transaction type here is lease transaction (Kuksenkova

2005). Commercial real estate can be categorized as profit-making, i.e. commercial, and profit-conditioning, i.e. industrial real estate (Sternik 2002).

Commercial real estate is divided into the following large groups:

– *office real estate* that embraces a great variety of the building types: office buildings, administrative buildings, business centres, mansions, detached buildings, ground floors of residential property, premises of former or acting enterprises, basement floors of buildings, flexible-purpose premises, etc. (Commercial Real Estate 2011);
– *hotel real estate;*
– *garages and parking areas* (as a rule they are not included in the classification of real estate but their sale, lease and purchase conform with the same rules);
– *retail real estate* that includes shops, showrooms, shopping centres, carts, shop departments, etc. (Commercial Real Estate 2014a);
– *storehouse real estate* that comprises both specially equipped warehouse complexes and storage areas in industrial parks and enterprises (Commercial Real Estate 2014b);
– *industrial real estate* that embraces industrial buildings, facilities, enterprises.

2.3. Development of office real estate

Office real estate development is one of the most competitive market segments in the development sector. In this sphere, enterprises of different sizes can be found, starting from individual entrepreneurs to large multinational corporations and real estate investment funds. Office users are also classified by their variety and occupied area that can range from 50 m^2 or smaller to office complexes located in the city or its suburbs and occupying tens of thousands of square kilometers. Development of small office buildings and large office complexes usually has the same challenges however the extent of the problems is defined by different time consumption. Office developers usually start from market analysis or tenant search, however sometimes they seek development opportunities of the available land plot that is appropriate for office development. By taking risks, developers select a target market, find a suitable land plot, design the project, find primary tenants, obtain a construction license, build and lease the building. The developers contracted by a tenant construct a building matching the tenant's requirements.

2.3.1. Classification of office real estate

When classifying office premises in every city, region, municipal district, different factors are considered by which premises can be referred to a particular

class. Such factors may include location, quality of the building (interior finishing, façade condition, entrance condition, availability of lifts), management quality (management company, additional services for the tenants), etc. Below is the list of common classifications of office premises/centre (Collier *et al.* 2007).

Table 2.6. cites the classification criteria of office premises (Ahern *et al.* 2014a). Internationally recommended classification is given in Table 2.7.

Table 2.6. Classification criteria of office buildings by quality (Sternik 2003)

Class	Description	
	Parameter	Explanation
Class A	Assumed name	Business centres
	Age of building	New construction
	Location	First class. Location on main traffic roads and areas, convenient road access
	Construction solutions	Monolith-frame, metal-frame building. Possibility to build raised floors and dropped ceilings; floor-to-floor height not less than 3.6 m (not less than 2.7.m from raised floor to dropped ceiling)
	Layout solutions	Optimum. Rational effective column grid (intercolumn spaces not less than 6 m), rational proportion between columns and windows
	Architecture and finish	Made-to-order (custom) design. Exterior finish by high-quality materials. Interior finish by tenant's custom order. Panoramic windows.
	Engineering	High-quality, by foreign manufacturers. Automated life-support systems. Fully-controlled indoor microclimate, thermostatic and humidity control by a single combined HVAC system (usually supported by four-pipe fan coils). Modern security systems; UPS (Uninterruptible Power Supply)
	Infrastructure and service	Large-scale infrastructure of centralized provision of tenants by office equipment, communications facilities, conference halls, housekeeping and recreational services
	Parking	Sufficient number of car parking spaces in underground parking. Security parking area with the number of car parking spaces not less than one per 60 m^2 of office area
	Building management	Professional management complying with the international standards. Professional experienced lessor. The building is maintained in ideal condition with its own security, management and maintenance services. Legal documentation of ownership and operation rights.

Class	Description	
	Parameter	Explanation
Class B	Assumed name	Business centres, office buildings
	Age of building	5–7-year operated business centres, new office buildings or reconstructed mansions.
	Location	Non-conformity with some Class A requirements (remoteness from traffic roads, inconvenient road access)
	Construction solutions	Monolith-frame, metal-frame, brick buildings. Possibility to build raised floors and dropped ceilings
	Layout solutions	Non-conformity with some Class A requirements (obsolete building)
	Architecture and finish	
	Engineering	Fully-controlled indoor microclimate, thermostatic and humidity control by a single combined HVAC system (usually supported by four-pipe fan coils). Modern security systems; sufficient engineering support facilities; UPS (Uninterruptible Power Supply)
	Infrastructure and service	Narrower range of services
	Parking	Parking with the sufficient number of car parking spaces
	Building management	Professional management complying with the international standards. Professional experienced lessor. Legal documentation of ownership and operation rights.
Class C	Assumed name	Office buildings
	Age of building	Obsolete office buildings, reconstructed buildings of other purpose
	Location	Flawed location (remoteness from traffic roads, inconvenient road access)
	Construction solutions	Possibility to build dropped
	Layout solutions	Adequate floor plans
	Architecture and finish	No architecture requirements are specified. Renovation complying with the Western standards
	Engineering	Comfort cooling or split-system AC unit
	Infrastructure and service	Poor infrastructure of business and recreational services
	Parking	Insufficient number of car parking spaces
	Building management	24-hour security; good maintenance service, experienced lessor

Class	Description	
	Parameter	Explanation
Class D	Assumed name	Nonresidential premises in administrative and office buildings, research institutes adapted to office conditions
	Age of building	Over 10 years
	Location	No requirements are specified
	Construction solutions	
	Layout solutions	
	Architecture and finish	More or less proper repair
	Engineering	Obsolete engineering communications
	Infrastructure and service	No requirements are specified
	Parking	
	Building management	No specialized maintenance or life-support systems
Class E	Assumed name	Nonresidential premises in residential and nonresidential buildings adapted to office conditions (ground floors and basement floors of residential houses, former kindergardens, etc.)
	Age of building	No requirements are specified
	Location	
	Construction solutions	
	Layout solutions	
	Architecture and finish	More or less proper repair
	Engineering	Obsolete engineering communications
	Infrastructure and service	No requirements are specified
	Parking	
	Building management	
Class F	Assumed name	See Class E, not adapted to office conditions, no repair (finish)
	Age of building	See Class E
	Location	
	Construction solutions	
	Layout solutions	
	Architecture and finish	Reconstruction and repair (finish) are needed
	Engineering	See Class E
	Infrastructure and service	
	Parking	
	Building management	

Table 2.7. International classification of office real estate (Shevchuk 2009)

Class	Description
Class A1	1. International developer. 2. Central location, convenient road access. 3. Fully rebuilt building. 4. Microclimate is controlled by a single combined HVAC system and by four-pipe system. 5. Open space plan by «shell-and-core» standard: – raised floor and dropped ceilings, – floor-to-floor height – 3.6 m, – rational effective column grid – intercolumn spaces not less than 6 m. 6. Underground parking and convenient access. 7. Uninterruptible Power Supply (UPS). 8. Modern security systems. 9. Professional lessor. 10. Correct documentation of ownership rights. 11. International property management company.
Class A2	1. Central location, convenient road access. 2. Building fully reconstructed in the 1990s. 3. Fully controlled indoor microclimate. 4. Open space plan by «shell-and-core» standard. 5. Sufficient number of car parking spaces and convenient access. 6. Uninterruptible Power Supply (UPS). 7. Modern security systems. 8. Professional lessor. 9. Correct documentation of ownership rights. 10. International property management company.
Class B1	1. Central location, convenient road access. 2. Reconstructed building. 3. Autonomous heat supply system and comfort cooling. 4. Efficient floor plan by way of office blocks. 5. Proper repair by European standards. 6. Sufficient number of car parking spaces and convenient access. 7. Modern lifts. 8. 24-hour security. 9. Professional lessor. 10. Correct documentation of ownership rights. 11. International property management company.
Class B2	1. Central location. 2. Renovated building. 3. Efficient floor plan by way of office blocks. 4. Proper repair by European standards. 5. Road access not always convenient. 6. 24-hour security. 7. Professional lessor. 8. Correct documentation of ownership rights. 9. International property management company.

Class	Description
Class C1	1. Central location. 2. Cosmetic repair of the building. 3. Efficient floor plan. 4. Proper repair. 5. 24-hour security. 7. Experienced lessor. 8. Correct documentation of ownership rights. 9. International property management company.
Class C2	1. Various locations. 2. Building converted from former research institute or administrative building. 3. Various conditions of premises: from Soviet-type repair to modern stylish interior design. 4. 24-hour security. 5. Correct documentation of ownership rights. 6. Property management services.
Class D	1. Various locations. 2. Not really convenient road access. 3. Building converted from former research institute or administrative building. 4. Cheap repair. 5. Security. 6. Correct documentation of ownership rights. 7. No property management services.

Table 2.8. Classification of business centres

Category	Location	Type and performance standards of the building	Level of property management company and services provided
A	Historical city centre; Convenient road access; Excellent look; Developed urban infrastructure	Detached specialized buildings; New construction or reconstructed buildings; High-quality repair and finish; High-quality engineering communications (backup power supply, air conditioning, heating, fibre-optical communications); Effective floor plan by way of office blocks; Conference hall, café/restaurant; Parking area	Professional company (experience not less than 3 years, not less than two assets under management); Large-scale system of additional services; Highly professional security and management services (incl. maintenance and cleaning services); 24-hour security and video surveillance.

Category	Location	Type and performance standards of the building	Level of property management company and services provided
B	Historical city centre; Adjacent areas located along embankments, close to traffic roads	Detached specialized buildings; Random major repairs with high-quality finish; Good state of engineering communications (ventilation and heating systems, fibre-optical communications); Effective floor plan; Conference hall, café/restaurant; Parking area	Professional company (experience not less than 3 years, not less than two assets under management); Security and management services (incl. maintenance and cleaning services); 24-hour security and video surveillance.
C	Outlying areas; Location close to main traffic roads, subway stations	Former administrative buildings, research institutes; Various conditions of premises: from Soviet-type repair to modern interior design; Sufficient number of telephone lines.	Internal or external property management company; Security and management services (incl. maintenance and cleaning services).

Table gives classification of business centres proposed by “Becar Commercial Property” company for the Guild of Property Managers and Developers (GPMD). At the heart of the 27 classification are parameters describing the quality level of business centres. The classification uses international standards of office real estate developed by the British Council for Offices as well as BOMA international standards (Building Owners and Managers Associations) (Ahern *et al.* 2014b).

The terms of “business centre” and “office centre” are considered identical. GPMD classification has been developed to ensure standardization uniformity among the operators of commercial office real estate.

In 2006 leading advisors of commercial real estate, members of Moscow Research Group (CB Richard Ellis Noble Gibbons, Colliers International, Cushman & Wakefield Stiles & Riabokobylko и Jone Lang La Salle) developed a new classification of office buildings. According to their classification it is not sufficient for the office building to match any 16 parameters out of the 20 listed above to be categorized as Class A.

Main requirements specified for office buildings:

1. High-quality standard finish, modern engineering communications, including BMS (Building Management System);

2. Professional property management;
3. Good location of the building, convenient road access and transport communications;
4. Air conditioning system not less than two-pipe or equivalent;
5. Dropped ceilings;
6. Floor-to-ceiling height averages 2.7 m;
7. Efficient open floor plan (bearing columns construction);
8. Three-section duct for electricity, telephone and computer cables or raised floor (or possibility to build it);
9. Modern high-quality windows, their rational layout;
10. Modern high-speed lifts with waiting time not more than 30 seconds;
11. Underground parking;
12. High-quality finish materials in public spaces;
13. Car parking spaces (ground and underground levels) not less than one parking space per 100 m^2 rented building area
14. Loss factor (proportion of active and rented areas) not more than 12%;
15. High-quality provider of telecommunication services;
16. Two autonomous power supply sources or uninterruptible power supply (power capacity for low-voltage networks of the tenant should be not less than 50 Wt per 1 m^2 of active area + additional 20 Wt for lighting);
17. Permissible floor deck stress – 400–450 kg per 1 m^2;
18. Modern security systems and access control;
19. Café/dining hall for employees and other facilities;
20. Window-to-window floor depth – not less than 18–20 m.

Office building of Class A should comply with the established minimum of 16 standard criteria out of 20 or be above the minimum. Office building of Class B should comply with the minimum 10 standard criteria out of 20.

Office building of Class A should comply with 20 compulsory criteria and four optional ones, that of class B+ should meet 10 compulsory criteria and 12 optional ones, that of class B- should meet 7 compulsory criteria and 12 optional ones. Buildings that fail to comply with the above listed criteria are categorized as Class C or below. Market players claim that according to the new classification half the Class A offices do not correspond to the modern parameters of the Class (Tom De Marko Deadline 2006).

2.3.2. Specific features of office real estate development

Location

Selection of location is the main step in economic feasibility study of the project as location has an immediate effect on rental costs and occupancy rate. When evaluating the potential of the building for office purposes and its attractiveness

for prospective tenants, all features of the building should be carefully studied. When identifying positive and negative development factors, the developer should compare different locations, their accessibility and physical attributes. Such comparison should involve analysis of rental costs and occupancy of the buildings located in adjacent areas. Any differences in planning or other factors that may restrict development should be registered.

In contrast to other land-use purposes, office buildings often have the highest rental costs so such buildings are constructed on the most valuable land plots. High value of land plots should not discourage developers when they are selecting appropriate land plots. High value often indicates attractive sites for office development. If developers choose cheap land plots, they are unlikely to be competitive on the market even if the rental fees are relatively low.

Efficient development project should be implemented on the land plot. Office buildings are less flexible in terms of shape and size as compared to industrial buildings, retail shops and residential houses. Users of back offices (e.g. operation offices or data processing offices) prefer large-sized buildings with one-floor area of over 2,000 m^2. Users of small-sized offices such as professional associations and small enterprises choose buildings with large windows and one-floor area of 1,500–2,000 m^2. However, very often one-floor area of the buildings can be smaller. The most convenient buildings are those with the width of 30 m and the length of 60 m. For this shape the main axis module is 6×30 m, the office depth is about 12 m. But such primitive square buildings have unattractive design, therefore it may prove difficult to get approval by local people. Prospective lessors also disapprove of simple "box" designs if they don't match the lessor's image. Due to high land cost, building of multistorey car parkings is justified, however, they are less flexible in terms of design layout than office buildings. Effective plans of such car parkings should contain 18-20-meter-wide modules and there must be at least two car parking areas. A convenient drive-out way must be minimum 16.5 m long. Separate car parking areas are cheaper to build than the parking areas integrated with the office buildings because construction requirements placed on parking areas differ from those placed on office buildings. Generally, the land plot area of the office development should be very large to have enough space for a detached car parking area, apart from the land plots of very high land value. Often one car parking area serves several office buildings.

Another important aspect of the land plot selection is its accessibility. The land plots should have an access to highways and regional traffic roads. Land plots located close to highways and major roads must be conspicuous, however they often don't have any access to those highways. Therefore, road access certificates must be obtained from self-management authorities and regional traffic departments to proceed to another development stage. The results of traffic surveys will be used when designing entrance and exit ways to the land

plot, internal traffic plans on the land plot. Besides, this survey is indispensable for obtaining construction licenses. Entrance way is of crucial importance, particularly if traffic streams are often busy. In most big cities transport traffic roads operate at the breaking point so alternative ways for personal cars are an important marketing tool.

Office building are advised to be constructed in the locations with a special environment. There is a synergy between office buildings on the one hand and between restaurants, shops, recreational and entertainment centres, hotels and residential buildings on the other hand. This combined development is highly advantageous as it eventually results in increased rental fees and growing demand for the premises.

Earlier, office developers were concerned only with local policy of planning and construction. Main critical parameters of development projects on specific land plots were land development rate (LDR), height limit of buildings, distance between building walls and land plot boundaries, requirements to parking areas.

Today planning regulations specify upper limits of office building height, however these regulations have become more complicated and confusing. People often have a wider discretion project revision not only in terms of their compliance to the planning regulations but their environmental effect and community impact that are difficult to quantify. In some cases, specific negative impacts such as increased traffic over some crossings can be eliminated by building certain structures outside the land plot boundaries, e.g. traffic lights or additional traffic lanes. Other impacts such as traffic overload or scarce housing that is affordable to the city-dwellers cannot be eliminated by one project. These impacts can be mitigated by means of environmental tax levy. Over the past 20 years developer faced new regulations that are applied to office buildings. Some initiatives to increase tax revenues are related to self-administration needs for regulating negative aftereffects of office development such as discomforted traffic and other impacts. As a result of these actions regulation of office development becomes contradictory. On the one hand, the city needs the office buildings because they do not add to environmental pollution and create new jobs. Office development is also tax-beneficial as offices pay more taxes than usual utility services. However direct tax benefits of office development cannot be measured up with retail development and their sales taxes. Reduced tax revenues forced city administrations to use office development for funding of social projects and programs, e.g. municipal housing construction. As a result taxes directed to infrastructure maintenance increased dramatically, new requirements were placed on developers, owners with small income were made to contribute to social programs, e.g. construction of a 200-apartment house per each 100,000 m^2 of office area. In some cases the results of such policy are conflicting, particularly during economic recession and when employers become too choosy. For

instance, if infrastructure maintenance taxes are high, businesses can be forced to move to the suburbs.

National institutions regularly discuss construction regulations in the field of construction safety and public health or owing to legal claims or threats of lawsuits. As soon as some information is received about effects of fires, storms or other impacts, the construction law is amended. At present strict requirements have been introduced in the sphere of energy consumption in built environment and these requirements are likely to become stricter in future.

Limitations of building conglomeration and lighting are intended to prevent shadowing of cities. Planning regulations specify permitted shapes of fencing and buildings that do not project shadows and ensure reflection of light and heat from the glass surfaces to other buildings. Some national institutions also specify the materials used in office construction, architectural styles, position of entrance doors and many other aspect of construction design. One of the legal tools applied to urban office development is transferable development rights (Realtor 2010).

One of the most arguable office development aspects is the effect it has on traffic. Not too long ago traffic intensity was the problem of city centres only. Now suburban traffic jams are not less frequent than in the city centres.

When office development projects are submitted, a report on traffic impact must be filed in to obtain a construction license. As new office buildings considerably increase traffic intensity during rush hours, measures aimed at mitigating traffic jams are essential for the project to be approved. These measures may include street widening along buildings, putting of road signs, widening of traffic lanes or crossing, etc. Satisfaction of needs of transport infrastructure beyond the land plot boundaries can be costly and time-consuming as this must be done in collaboration with public organizations and other property owners.

Office development may require the following operations:

1. Road marking.
2. Marking of drive-up and drive-down lines on entrance and exit ways.
3. Marking of dividing strip to control accessibility.
4. Putting of road signs at the entrance or at the nearest crossings (or at crossings where traffic is likely to become more intensive after the construction project jas been implemented).
5. Widening of the street opposite to the building.
6. Widening of the streets between the developed building and highways.
7. Building of a new road connecting the development site with a major traffic road.
8. Co-financing of multi-level junction construction.

Thus, the assumed traffic intensity during rush hours that will result from the development becomes an important factor of the project cost calculation.

To reduce the traffic intensity during rush hours, some activities can be implemented such as supplementing the project by retail premises, construction of [residential buildings on the land plot or adjacent areas, integration with the public transport system (Raslanas *et al.* 2013). Development of buildings of different purposes is approved by developers and administration officers; location of shops in the building is beneficial for lessors. On the other hand, project payback from the perspective of office building and retail location will attract more customers thus leading to increased traffic intensity.

When selecting a development site, city centre or downtown areas are preferred. Environmental factors are less important than in residential areas but do not recede into the background. Therefore, office buildings should be developed not along major roads but in close proximity to them. An important issue is the possibility to build an underground parking area or availability of car parking space (Sternik 2003).

In marketing issues the developer is guided by legal persons. The project may foresee sale of premises or their lease. Frequently the project is customized for one or two clients at the finishing stage. It is highly important to sign preliminary agreements with tenants at early stages of the project.

All developers aim at maximum gained active area. Although if a top-notch building is constructed the developer has to cut the active area in favour of public premises. An optimum choice that every developer seeks to make is a flexible space planning. The developer prefers to lease out the whole floors not to lose the active area due to corridors and public spaces.

Architecture of office buildings is hardly important. The level of services, finishing, engineering communications must meet the class of the targeted customers (Typology of Hotels 2007).

Raising funds of future tenants or buyers plays a crucial role for the project financing already at the construction stage. If project is customized, it is possible to raise the customer as a strategic investor. Office building that is to be leased out requires long-term financing, often taking up to 5–10 years (Classification of commerce and warehouse spaces 2005).

Case study. A development project of a regional business centre

1. Project description

The main objective of the project is design and construction of a regional business centre (RBC) with modern architecture and complying with international standards to develop regional business infrastructure and to create favourable conditions for entrepreneurship and government agencies that will improve business efficiency and attract business community and investment to the regional economy.

The 43,300 m^2 regional business centre of high European standards is aimed at providing full range of services and combines business, hotel, cultural and entertainment organizations. It will become a point of attraction for business elite and the centre of regional business. The unique range of services which is long overdue in the region initially involves infrastructure development for entrepreneurship in terms of:

– information and marketing support;
– presentations, fairs and exhibitions;
– expert services;
– innovation and technical support;
– training of business professionals;
– meeting needs for high-quality business services that improve business efficiency and promote international standards of business among local companies;
– ongoing dialogue between business elite leaders, heads of government agencies and regional investors;
– holding of any events on the highest level;
– creating a good rest environment.

An innovation and technology centre and a centre for consultancy and engineering support will take up a special position in the RBC structure. These centres will aim at integration of scientific and technological resources, highly-qualified professionals and information resources of regional organizations based on priorities and development of promising competitive trends as well as at providing consulting services for businesses in the matters of legal regulations, finance and economy, environmental and technological safety, consumer right protection, intellectual property protection.

The information and marketing centre will comprise consulting department, information department and marketing department, Internet service providers, conference hall, press centre, library and other departments to provide a wide range of services.

Training of entrepreneurs in effective business operations will be carried out in the centre for entrepreneurial support and development, so-called “business incubator” where business people can learn how to run their own business at all stages of its development.

A separate RBC building will house a business class hotel providing comfortable accommodation of guests and business partners with a full range of European-level business services. The hotel guests will have access to the following facilities: mini business centre, conference hall and conference rooms. A special business club will offer an opportunity for regular informal communication of Russian and foreign business representatives and officers of government agencies.

RBC is supposed to house health improvement facilities, consumer and recreational services for business community, to include shopping centre, recreational centre offering special health improvement programs for company directors. Bars, restaurants, a cinema hall, a VIP-room, a casino, bowling, billiards, saunas and other recreational facilities will render excellent leisure services to the RBC regular visitors, guests and residents of the region in the refined and home-style environment.

Parking area and underground parking will naturally complement the diverse range of services offered by the centre to business people.

In addition, an important factor of social significance of the proposed project is that it will create a wide scope of employment opportunities during both the construction stage and business centre operation.

Project implementation will yield considerable mandatory payment and tax receipts to different-level budgets. High commercial performance of the project is in its profit-earning capacity and payback period of investments together with sufficient financial sustainability:

– return to permanent profitability is expected in 2009, i.e. in the year preceding the operating phase of the centre as a whole. All functional areas operating on a full-time basis, the net profit will amount to more than 30 million RUR and total profit of the project over the monitoring period will make over 1.3 billion RUR.
– estimated payback period is 6.8 years.

Urban planning significance of the project is attributed to its central location in a close proximity to the central bus station, children's park, national television and radio broadcasting company, major city road.

The investment attractiveness of the project is determined by increased internal rate of return and high return of capital employed.

2.3.3. Financial capacities

An important issue of the feasibility analysis is the analysis of the project's financial capacity that is required by loan institutions. To assess financial capacities of office development, the same methods are employed as for any profit-making property. The financial analysis involves calculation of profit capitalization and study of discounted cash flows including payback to the investors and common venture owners. Analysis of financial feasibility (AFF) of profit-making real estate development must be carried out on a stage-by-stage basis when more detailed information is gained at each stage ranging from land purchase to final decision-making.

A major challenge which the developers face when doing an AFF is to define what kind of analysis is appropriate for each stage. For instance, a detailed

analysis at the early development stage is quite expensive and time-consuming whereas an overgeneralized analysis does not provide sufficient decision making data. Financial analysis of profit-making real estate comprises five stages (Gallinelli 2008):

1. Calculation of simple capitalization of anticipated net operating income (NOI);
2. Analysis of discounted annual cash flows (DCF) during stabilization period;
3. General analysis of use and development periods;
4. Calculation of monthly cash flow during development period;
5. Analysis of discounted cash flows (DCF) to investors.

Table 2.9. Development and use periods

Months	Development period				Management period
	0	6	18	36	84–120
	Drawing up a prepayment contract	Entry into force of sales-purchase contract: Construction start	Finishing work: Lease start	90% leased out: Repayment of mortgage loan	Sale of completed project
	Combined development and management period				

Stage 2 is considered to be the most important one. It has various names: analysis of discounted cash flows (DCF) and analysis of investment justification. At the second stage of analysis, profitability indexes of the managed property are calculated without regard to external financing and income that was obtained during the period when offices were consistently leased out until the final date of sale, i.e. over 7–10 years. General analysis separately defines periods of development and management (Table. 2.9). The development period starts with land plot purchase and finishes when the completed building is leased out. However, the use period starts only when the apartments are ready for use, appraisers and loan suppliers usually evaluate the building when the occupancy rate approaches 90% and the loan is repaid after the property is sold completely. The analysis makes it possible to evaluate the management period (in some cases long-term mortgage loans can be repaid over time). Different development alternatives are calculated as well. For the first iteration rental taxes, costs, expenses and other parameters are calculated in a rough way. But when the developer is ready to draw up a prepayment contract (i.e. to specify some provisions for withdrawal of the total deposit money), he must be equipped with comprehensive data on the

potential efficiency of real estate use. These data provide necessary grounds for calculating potential profit of the developer and investor based on the current property value. If an office building is constructed, the value will be calculated based on all project costs from the starting stage to the stabilized occupancy.

The analysis stages correspond to main steps of project financing. The first stage supposes shallow analysis based on simple predictive evaluation of income and expenditure. The second stage determines the value of the whole property and the analysis data are given to investors that are to finance the project. The third stage provides general overview of development from project start to complete sale. The fourth stage of the financial analysis is aimed at the construction creditor. It is necessary to obtain a loan for construction and interest payment reserve during construction and lease.

The fifth stage provides prospective investors with justification of their investment in real estate with regard to the share paid by each investor.

Stage 1. Simple capitalization. Tables 2.10–2.15 show the analysis stages of a new office building. The construction plan contains three types of offices. Average monthly rent has been calculated and total expenditure of development has been estimated.

Table 2.10. Stage 1a: summary table of rental taxes

4 Office type	Number of offices	Rental tax per 1 m^2, €	Office area, m^2	Total area, m^2	Monthly rental tax, €	Annual rental taxes by office type
5						
6						
7 Office A-1						
8 Office B-1						
9 Office C-1						
10						
11						
12						
13 Total rental income						
14 Other income (car parking, discounts)						
15 Total income						

Stage 1a. Summary table of rental taxes. At this stage two return rates are calculated, i.e. general rate of capitalization (absolute profitability) and cash-on-cash return. To calculate these parameters, we should start with anticipation of NOI (Net operating income) and estimation of development and financial

gearing costs (at the rate of maximum mortgage value). Summary data about rental taxes are given in Table 2.10. The rental taxes are calculated on the basis of thorough analysis of similar offices located in the same area where new construction is planned.

Stage 1b. Net operating income estimation.

At this stage, a pro forma statement of valuated rental taxes and expenses is needed when the project starts operating in a reliable way. The benchmark data should cover office types and sizes as well as their market rental taxes (Table 2.11.). Other necessary data include the vacancy rate of the leased offices and operation costs. Estimation of income and expenditure must reflect local market conditions and all specific features of the project, i.e. it should be based upon the situation of lease. For instance, if design and construction take one year, rental taxes should be estimated for a year ahead. Thus, total income and net operating income (NOI) are anticipated.

Table 2.11. Stage 1b: Net operating income estimation

3	Factor	Annual income/ expenditure
4 Income		
5 Total potential rental income (see Table 4.10)		
6 Minus vacancy, %		
7		
8 Corrected rental income		
9		
10		
11 Total income		
12		
13		
14 Expenditure		
15 Property management		
16 Controlled costs (earnings, maintenance, repairs, marketing)		
17 Real estate tax, %		
18 Insurance		
19		
20 Total expenditure		
21		
22 Net operating income		

Stage 1c. Calculation of maximum loan. Estimated net operating income serves as a basis for calculating long-term loan value (Miller *et al.* 2007). Maximum loan value is governed by two criteria: debt cover ratio (DCR) and loan-to-value ratio (Table 2.12). DCR helps to identify financial investment risk that is calculated by dividing net operating income by loan servicing costs. If DCR equals 1, then NOI equals the amount aimed at loan servicing. For real estate to make profit, the loan suppliers want DCR to be not less than 1.2. DCR makes it possible to estimate a reserve amount that NOI is allowed to come down to when property generates insufficient cash flows to cover the loan debt. The greater the reserve amount, the lower the risk of failing to perform financial obligations. Loan suppliers choose the largest reserve amount they can get. Developers prefer larger financial leverages in order to obtain the largest possible loan that bates demands on their own capital.

Table 2.12. Stage 1c: Maximum loan amount

3 Estimated NOI and its value	
4 Estimated NOI (as calculated by Table 1b)	
5 Capitalization rate (CR)	
6 Value (NOI/CR)	
7	
8 Loan conditions	
9 Interest rate	
10 Loan period (years)	
11	
12 Loan-to-value ratio (LTV)	
13 Maximum LTV	
14 Maximum LTV based loan amount	
15	
16 Debt cover ratio	
17 Monthly NOI	
18 Maximum DCR	
19 Maximum monthly repayment (NOI/DCR/12)	
20 Maximum DCR-based loan amount	
21	
22 Maximum loan amount (the lower by two criteria: LTV or DCR	
23 Maximum primary loan	
24 Monthly repayment	
25 Annual loan servicing	

To estimate maximum loan repayment costs, we calculate it from NOI by means of DCR. Given the loan supplier's requirements to loan repayment and interest rates, it is possible to calculate maximum loan that can be serviced by project income without the required cover. For example, if DCR is 1.25, it will ensure monthly loan repayment equaling the NOI divided by 1.25. Given the interest rate % and loan repayment period of *n* years, the maximum loan amount provided by the loan supplier equals to the current NOI value.

When maximum loan amount is calculated by means of loan-to-value ratio, it is necessary to estimate the project value. This value can be estimated by capitalization rate to the net operating income. Capitalization rate is determined by the market, i.e. by sale price of similar real estate over the recent period. It shows the income-to-value relation. Loan suppliers require the estimation to justify income generated by the real estate and prerequisites that are applied to determine capitalization rate to estimate the value. Further, the value is multiplied by the LTV parameter to calculate the maximum loan amount. Loan suppliers consider both criteria but prefer to choose the most restricting one. When interest rate is low, the LTV parameter will be more restricted, but when the interest rate is high, it will be debt cover ratio.

Table 2.13. Stage 1d: Development costs

5 Development value			
6 Number of offices			
7 Total area (m^2)			
8			
9 Land plot		per office	
10	Value	Period, months	
11 Land sale, %			
12 Tax authorization		per office	
13 Construction costs		Per 1 m^2 of total area	
14 Additional costs			
15 Architecture and engineering		per office	
16 Legal services		Total	
17 Appraisal and title document		Based on total costs + 20 € per one operation per each office	
18 Marketing			
19 Construction period taxes			
20 Construction insurance		per office	
21 Loan obtaining expenses		Based on long-term loan amount	
22 Total additional costs			
23 Additional developer's costs			

24			
25 Unexpected expenses			
26			
27			
28 Total development costs excluding interest payment reserve and operating expenses during lease-out period			
29			
30 Estimation of interest payment amount during construction period			
31 Long-term loan			
32 Interest rate during construction period			
33 Construction time (months)			
34 Average interest payment			
35 Approximate interest amount during construction period			
36			
37			
38 Total project costs before reserve operating expenses			
39			
40 Estimation of reserve operating expenses			
41 Total rental income (per month)			
42 Rental period (months)			
43 Average occupancy over the rental period			
44 Rental income			
45 Estimated operating expenses during rental period			
46 NOI during rental period			
47 Total interest of construction loan during rental period			
48 Required reserve operating expenses during the first year			
49			
50			
51 Total project costs (full project value)			

Stage 1d. Development costs. Development costs represent the right-hand member of the equation when analyzing the project feasibility. The development cost calculation should include land plot purchase cost, construction costs and such additional costs as legal and accounting services, engineers' and architects' fees as well as unexpected expenses. As a result, the developer will have more comprehensive information about the project value. However, FTA depends on the developer's experience of other similar projects and on the information provided by contractors and consultants. The costs must also comprise additional expenses of the developer and those geared to primary marketing and lease-out. First-time rough calculation of interest payment can be grounded on the average interest rates and loan period. The reserve amount of operating expenses during the lease-out period can be estimated by rental period and rental tax losses due to vacancy areas. Table 2.13 illustrates total development costs after interest payment and lease-out. Total project value is determined by roughly estimated interest rates over the development period and reserve operating expenses.

Stage 1e. Calculation of simple parameters. The first stage of the analysis is sometimes called the analysis of average parameters (Schmitz, Brett 2009). Even so, total payback (NOI divided by the total project cost) and current payback (cash flow exclusive of loan servicing divided by property capital) are most frequently applied payback parameters. For office projects the desired payback should not exceed 10%. As inflation increases, the developer expects increasing cash flows and sale incomes, primary current payback may vary from 6 to 8% (Table 2.14.). Calculations show the total payback and current payback as well as development income that is calculated as the difference between the market value of the sustainable project and total project cost at the given moment.

Total project cost		
Minus mortgage loan		
Property capital		
NOI		
Minus loan servicing		
Cash flow exclusive of loan servicing		

Table 2.14. Stage 1e: Simple parameters

5 Net operating income	
6 Total project cost	
7	
8 Total payback (general capitalization rate = NOI/total project cost	
9	
10 Net operating income	
11 Annual loan servicing	

12 International cash flow	
13	
14	
15 Total project cost	
16 Long-term mortgage loan	
17 Property capital	
18	
19 Current payback (Intermediary cash flow / property capital)	
20	
21 Development income	
22 NOI	
23 General capitalization rate at the moment of sale	
24 Capitalization cost	
25 Total project expenditure	
26 Development income	

Stage 2. Analysis of discounted cash flows. Analysis of discounted cash flows over the management period is a most important stage. Loan suppliers, appraisers and investors use the analysis to evaluate the benefits of the project to be developed. Even if the developer is planning to sell the project after it has reached a sustainable occupancy rate, the second stage of occupancy aims at identifying the value of development or investment in profit-making real estate (Table 2.15). In order to calculate net operating income, cash flows are predicted for the period of 7 or 10 years provided that rental fees and expenses are to increase. Both analyses after appraisal or non-appraisal of long-term financing can be summed up by a single table when supplemented with the data of mortgage loan and income tax. Developers use the second stage to determine whether the payback rate of the proposed project will be beneficial. The analysis of discounted cash flows (DCF) is done repeatedly as soon as detailed and accurate data on the project, the development costs and estimated rental fees are available.

Primary options of the second stage may include calculation of internal return rate (IRR) without evaluating the long-term financing (internal return rate allows all project costs to be funded with the property capital), annual cash flows covering NOI (without evaluating the long-term financing or loan servicing) as well as the corrected sale price after 7-year management. IRR indicates the link between the operating cash flows, current sale price and invested capital. The payback should vary between 11–15% depending on the property type, location, interest rate and inflation rate (the higher the inflation rate, the higher, the total payback). Payback rate without long-term financing is calculated based on the annual NOI over the total management period, from the full occupancy of the building to the project sale. Before the taxes are paid, the payback is usually

too low for the planned project, however the historically low income can attract long-term financing and current payback.

The second stage of the analysis starts after the building has reached full occupancy rate. All interest charges over the rental period are included in the total investment cost. In this case, the building is considered to be fully leased out, even if it has not been constructed yet. Otherwise it could be stated that zero period data comprise all development costs of the construction period before the act of acceptance is drawn up. The first year (the second year if necessary) is the lease-out period. This being the case, the project is not considered profit-making until its second or third year. This reduces payback but accurately reflects the new development when a building is constructed and leased out from the ground up. These details are discussed during the third stage of the analysis.

Appraisers calculate actual cost by future cash flows at the discounted rate established on the market (usually ranging from 11 to 13%). The concept of actual cost corresponds to the future current cost. One euro is known to have a lower value in future. The discounted rate is applied to discounting of future cost to the actual one.

Table 2.15 Second stage of analysis

3 project expenditure, €				
4 Total project cost				
5 Total project cost before operating expense reserve is created				
6 Land value				
7				
8 Funding calculation				
9 Property capital				
10 Principal sum of mortgage loan				
11 Interest rate				
12 Payback period				
13 Annual loan servicing				
14				
15 Depreciation estimation				
16 Value of building and construction				
17 Period of usage				
18 Depreciation rate				
19 Annual depreciation (straight-line depreciation)				
20				
21 Mortgage loan payment		Year 1	…	Year 8
22				
23 Opening amount				
24 Ending amount				
25 Payment of principal loan sum				
26 Loan interest				

27				
28 Loss in value				
29				
30 Beginning depreciation				
31 Net of annual depreciation				
32 Ending depreciation				
33 Accumulated depreciation				
34 Straight-line depreciation				
35 Charges return				
36 Net fixed assets				
37				
38				
39				
40 Annual cash flows				
41				
42 Total rental income	inflation, %			
43 Vacancy	vacancy, %			
44 Corrected total rental income				
45				
46 Operating costs	inflation			
47 Other costs				
48 Total costs				
49				
50 Net operating income				
51				
52 Annual loan servicing				
53				
54 Pre-tax operating cash flow				
55 Tax calculation				
57				
58 Net operating income				
59 Interest				
60 Depreciation				
61				
62 Taxable income (losses)				
63 Payment of losses over the past passive periods				
64				
65 Taxable income				
66 Transfer of passive losses to future periods				
67				
68 Taxes				
69				
70 After-tax cash flows				
71				
72 Pre-tax operating cash flows				
73 Taxes				

74				
75 After-tax operating cash flows				
76				
77				
78 Sales calculation				
79				
80 Pre-tax sales cash flows				
81 Sales value (capitalization rate applying next-year NOI)				
82 Commission charges				
83 Corrected sales price				
84 Unpaid mortgage loan				
85 Pre-tax sales cash flows				
86				
87 Taxes				
88 Corrected sales price				
89 Net fixed assets				
90 Total taxable income				
91 Transfer of passive losses to future periods				
92 Total income				
93 Total accumulated depreciation				
94 Deferred tax (25%)				
95 Capital increase (income)				
96				
97 Capital yield tax				
98				
99 After-tax sales cash flows				
100 Pre-tax sales cash flows				
101 Total taxes (deferred tax and capital increase)				
102 After-tax sales cash flows				
103				
104				
105				
106 Payback parameters	Investment			
107				
108 Non-leverage IRR				
109 Project cost				
110 Net operating income				
111 Corrected sales price				
112 Pre-tax sales cash flows				
113				
114 Non-leverage IRR				
115 Actual net cost (10%)				

116				
117				
118 Pre-tax IRR				
119 Property capital				
120 Pre-tax operating cash flows				
121 Pre-tax sales cash flows				
122 Total pre-tax cash flow				
123				
124 Pre-tax IRR				
125 Actual net cost (12%)				
126				
127				
128 After-tax IRR				
129 Property capital				
130 After-tax operating cash flows				
131After-tax sales cash flows				
132 Total after-tax cash flows				
133				
134 After-tax IRR				
135				
136 Simple payback parameters				
137 NOI/Project cost				
138 Pre-tax cash flows/property capital				
139 Tax shelter/ property capital			-	-

The calculated actual cost will be equivalent to the cost of building after it has been leased out completely. The difference between discounted cost and development cost (equal to the net actual cost) is the developer's income known as the net actual cost (NAC). The use of the net actual cost method for the discounted cash flow (DCF) analysis justifies future investment in case the NAC is positive. Non-leverage NAC (without evaluation of long-term financing) of about 10% generates the developer's income if it assumed that non-leverage payback rate without long-term financing on the market is 10%. If it is lower, the developer's income will be higher. The IPR is directly proportional to the interest rates and inflation rate. Even though the non-leverage IPR is highly important, the developers are primarily concerned with the property capital payback rate (PCPR) that is expressed the same as internal payback rate. Additionally, long-term financing and income tax of the owner/developer are taken into account. The second stage analysis is aimed at the project payback as a single and

indivisible investment when each individual (owner/developer) invests his own capital and receives a cash flow.

Table 2.8 shows the analysis of the project for a long-term financing by mortgage loan. The developers are mostly interested in leverage payback of the property capital before and after taxes as the project investment has to compete with the payback from other investment, e.g. stocks or bonds. In the context of pre-tax and after-tax IPR, when low-risk financial markets ensure the payback of 2–4%, the project must involve a considerable reimbursement of the future development costs. The DCF project analysis must be updated in the following cases:

1. Before the developer draws up a prepayment contract. When the DCF model is designed at this stage, calculations are easier to update afterwards. To design a DCF model, the developer must get additional data which are different from those used to calculate simple capitalization indexes:
   – The projected built-up density and intensity depend on the buildings the developer is planning to construct or on the similar projects developed on the neighbouring areas;
   – Updated information about additional costs to obtain funding, as well as legal costs, architects' and engineers' fees, marketing and administraion costs.

The objective of the analysis at this stage is validation of the fact that the project is worth the time and investment necessary for further feasibility study. Besides, when economic feasibility of the project is studied, this first DCF calculation evaluates negative cash flows over the rental period. For instance, if the 95% occupancy rate is likely to be achieved within 16 months, the average occupancy will be 35.6% in the first year and 91% in the second year of the project life. In this way, the 95% occupancy rate is achieved (Table 2.16).

Table 2.16. Calculation of average occupancy rate

If the 95% occupancy rate is likely to be achieved within 16 months, the following average occupancy rates may be applied	
Year 1	(12 months/16 months) × 95% = 71,25%/2 = 35,62%
Year 2	(71,25% + 95%)/2 = 83,215% × (4 months/12 months) = 27,71% (95,00% × (8 months/12 months) = 63,33%
Average occupancy	91,04%

By annual deduction of average occupancy from 100%, we obtain average vacancy rates, that are 64.4% (100–35.6) and 8.96% (100–91.04) during the first and the second years for the above case study. The average vacancy rates are calculated in the DCF analysis when cash flows for the first two years are

determined or until the project operates on a sustainable basis. Negative cash flows are more likely to be expected for the first two operating years that proves investment of the property capital to be indispensable. These flows are included in the final cash flows calculation when IPR is estimated. Most developers include negative cash flows as the reserve operating costs over the rental period when estimating the project budget.

2. After the developer signs the prepayment contract, the prepayment amount is non-refundable. Therefore the developer should have a clear project concept beforehand. The developer and the architect should prepare a land plot plan and a development program that specify feasible amount of offices, their layout and average size. Based on the marketing study and advisory support, the developer should focus on the target market of the project. Given this information, the developer can more accurately predict rental income depending on the office types and specified rental fee per office. The decision-making regarding the prepayment contract is often subject to the advisory opinion, in particular, the study of soil and ground, bottom lands, engineering networks, planning issues. The main goal of the study is to identify all factors which may affect the development and the costs incurred. It is crucially important to have this information before the prepayment contract is concluded and the non-refundable deposit is made. Any data which have a direct effect on the project costs or development standards must be input in the DCF model to ensure feasibility of the project.
3. After the deposit money is non-refundable according to the prepayment contract, but before the sale and purchase agreement enters into force, the developer has the time to do as much as possible. Ideally, he should conclude a per-financing agreement. The following information is necessary for the next DCF cycle:
   - market study to determine types and sizes of offices, additional facilities and rental fees;
   - architectural and construction drawings based on the market study and made in sufficient detail to estimate construction costs with an accuracy to 5% of the total cost.
   - estimation of construction cost made by two or three general contractors (in case the development company has no construction department or a single contractor)
   - different contractors' proposals should be assessed in the proper way. The developer should be thorough when assessing the comprehensiveness of the projects.

Stage 3. Overall analysis of development and management periods. Before the deposit money of the developer is made non-refundable by the sale and purchase

contract, it is important to calculate and evaluate cash flows over the development and operating periods with a maximum accuracy. At this stage the analysis provides payback criteria over the total project life. This stage is more accurate than the previous one. The stage assumes the property capital to be invested for the period of stabilizing occupancy, though in fact this happens before the construction is started. Compared to the second stage, the analysis period has expanded for one or two years and the first year generates almost no cash flow, therefore IRR is lower at the third stage. Nevertheless a reasonably accurate picture of the project implementation comes into view.

The third stage of the analysis evaluates cash flows during each quarter of the development period with regard to the designed construction schedule and monthly lease-out rates. This analysis stage also envisages when property capital and loan funds are to be employed and for how long the interest will be charged on them until the project cash flows are able to service the loan. Costs are predicted on a quarterly basis at this stage. The third stage is the most challenging in terms of making calculations. It comprises three parts. Table 2.16 shows quarterly cash flows during the development period (construction and lease-out). Table 2.17 gives information about annual sources and application of funds during the development period. It summarizes project costs and separately identifies capitalization costs arising from the losses in the first years of the project life. The costs to be funded are predicted, however they are differently estimated when calculating tax income. Total project cost, total capital expenses, depreciation calculation, reserve operating costs and long-term loan refinancing are presented in Table 2.18. It features cash flows over the third operating period. The quarterly data of Table 2.16 are summed up to come up with annual indexes and are further transferred to Table 2.18.

Dual calculation of the property capital should be avoided as it comprises not only new property capital but also the positive cash flows over the rental period. Lines 30 and 31 of Table 2.17 must be the same annually. This analysis is similar to that of the second stage apart from the fact that it contains both construction and lease-out years (years 1 and 2) and supposes the occupancy rates to be sustainable in the first years already. It should be noted that the first year cash flow becomes zero as all property capital is invested before the first year and all costs are covered by the construction loan. The third stage of analysis provides for a more accurate estimation of interest and reserve operating costs over the lease-out period as compared to the first and second stages. At the third stage the construction loan interest is compared to that of the first stage and reserve operating costs are put in comparison with the data of the first stage (Table 2.18).

Table 2.17. Stage 3: first part of analysis Cash flows during development period, including first lease-out

Development						Lease-out							
4 Development costs, litas	Total, €	Total	0 time	1 year	2 year	1 quarter	2 quarter	3 quarter	4 quarter	5 quarter	6 quarter	7 quarter	8 quarter
5 Land value													
6 Land sale fee													
7 Licensing taxes													
8 Main construction costs													
9 Additional costs													
10 Architectural and engineering activities													
11 Legal services													
12 Appraisal and title examination													
13 Marketing													
14 Taxes over the construction period													
15 Insurance over the construction period													
16 Loan costs													
17 Extra costs of the developer													
18 Unforeseen costs													
19													
20 Total development costs exclusive of the interest on construction loan and reserve operating cost													
21													
22													
23 Operating income (losses) over the rental period													
24 Months until sustainable occupancy	12												
25 Quarterly rented offices													
26 Total offices rented													

Development						Lease-out							
4 Development costs, litas	Total, €	Total	0 time	1 year	2 year	1 quarter	2 quarter	3 quarter	4 quarter	5 quarter	6 quarter	7 quarter	8 quarter
27 After-lease vacancy rate (predicted per cent of the total area)				0	38%					75,00%	50,00%	25,00%	0,00%
28 Vacancy rate over the sustainable operating (predicted per cent of the total area)	5,00%			0	5,00%					0,00%	0,00%	0,00%	5,00%
29 Total vacancy				0	39%					75,00%	50,00%	25,00%	5,00%
30 Total income from prospective quarterly lease-out (based on NOI forecast)													
31 Losses from vacancy													
32 Corrected total rental income													
33 Total income													
34													
35 Operating costs													
36													
37 Net operating income													
38													
39 Total cash flow over the development period before interest charges are paid													
40													
41 Interest calculation and construction loan balance													
42	Total, €	Total	0 time	1 year	2 year	1 quarter	2 quarter	3 quarter	4 quarter	5 quarter	6 quarter	7 quarter	8 quarter
43													
44 Maximum unpaid loan balance (based on financial calculations)													
45													

Development						Lease-out							
4 Development costs, litas	Total, €	Total	0 time	1 year	2 year	1 quarter	2 quarter	3 quarter	4 quarter	5 quarter	6 quarter	7 quarter	8 quarter
46 Sources of property capital													
47 Property capital ending balance													
48													
49													
50 Estimation of construction loan													
51 Beginning balance													
52 Loan payments													
53 Construction loan payments													
54 Actual operating deficit													
55 Trial balance													
56 Additional property capital demand													
57													
58 Ending balance before interest charges are paid													
59 Average balance of unrecovered loan													
60 Total interest in construction loan													
61 Interest accumulated over the construction period													
62 Interest accumulated over the operating period													
63 Ending trial balance													
64 Additional property capital demand													
65													
66 Ending balance													
67													
68 Total demand for additional property capital													
69 Cash flow after interest payment													

Table 2.18. Summary table of development costs

3		Years		
4 Costs, €	Total	0	Year 1	Year 2
5				
6 Total development costs				
7 Interest charges on construction loan (quarter 4)				
8 Total capital costs				
9				
10 Operating cash flows				
11 NOI				
12 Interest on construction loan over the operating period				
13 Long-term debt servicing				
14 After-interest operating cash flow				
15 Total costs				
16				
17 Sources				
18 Ending unpaid construction loan				
19 Ending unpaid long-term loan				
20 Ending property capital balance				
21				
22 Sources of construction loan funds				
23 Sources of long-term loan funds				
24 Sources of property capital funds				
25 Additional property capital needed				
26 After-interest positive cash flow				
27 Total from all sources				
28				
29 Audit				
30 Property capital for capital investment (sources of property capital added by operating cash flows exclusive of the interest paid)				
31 Property capital for capital investment (total capital investment exclusive of loan funds)				
32				
33 Summary data				
34				
35 Capital investment				
36 Total development costs exclusive of the interest paid				
37 Interest accrued over the construction period (Table 4.16, line 61)				

38 Total capital investment				
39				
40 Depreciation base				
41 Total capital costs				
42 Land value				
43 Depreciation count method (capital costs exclusive of land value)				
44				
45 Reserve operating costs				
46 Operating losses over the rental period (Table 4.16, line 62)				
47 Interest accrued over the operating period (Table 4.16, line 62)				
48 Interest paid over the operating period (Table 4.16, line 63)				
49 Total operating reserve backed by the construction loan				
50				
51 Total project costs (capital investment added by reserve operating costs)				
52 After-interest positive cash flow				
53 Total project costs after one operating year				
54				
55				
56 Cash receipts from long-term refinancing				
57 Mortgage amount				
58 Ending unpaid construction loan				
59 Cash receipts from long-term refinancing				

Table 2.19. Comparison of calculation results

	Stage 1d (Table 4.13)	Stage 3 (Table 4.17)	Difference
Construction loan interest, €			
Reserve operating costs, €			
Total, €			
Total project costs, €			

At the third stage the construction loan interest charges are lower because the property capital is assumed to be invested before the loan supplier lends money. As a general rule, loan suppliers require the property capital to be invested before any construction loan is granted. Provided the first construction stages are funded with the property capital, average non-refundable loan is much lower than provided (65%) at Stage d (line 34). Reserve operating costs are lower at the third stage as the non-refundable construction loan is smaller at the end of

each year and will never amount to the maximum loan which the interest was charged on at the first stage. There is another less careful provision that rental taxes will be received from that quarter forth when the premises were leased out (this provision must be reconsidered at other stages of the analysis). Considerably smaller interest taxes of construction loan and reserve operating costs enable the developer to discuss with the loan supplier the amount of the reserve funds needed. Loan suppliers can be very prudent when making calculations to make sure that interest reserve is sufficient to protect the developer against possible delays in construction and office lease-out. The developer must have that reserve money but must avoid doing so if possible: very careful calculation unreasonable increases total project value thus making it uncompetitive.

At the third stage, pre-tax and after-tax IRR shows the project efficiency in a more accurate way than at the second stage as calculations were made based on the quarterly data of construction loan payments and forecast data of office lease-out. Usually, the third stage IRR is lower than that of the second stage as positive cash flows are more rapidly generated in the third year as opposed to the first one. In the instant case they are approximately equal as more accurate calculations of the construction loan interest and reserve operating costs over the rental period diminish total development costs.

Table 2.20. Stage 3: second part of analysis
Total pre-tax and after-tax cash flows over the development and operating periods

Development period				Investment period									
4 Mortgage loan payment , €	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
5 Beginning balance 1													
6 Ending balance													
7 Capital depreciation													
8 Interest charges													
9													
10 Depreciation charges													
11 Beginning depreciation 2													
12 Exclusive of annual depreciation													
13 Ending depreciation													
14 Accumulated depreciation													
15 Straight-line depreciation													
16 Depreciation charges refund													
17 Balance value													
18													

Development period				Investment period									
19 Annual cash flows		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
20 Total rental income, 3%													
21 Vacancy index, 5%													
22 Vacancy losses													
23 Corrected total income													
24													
25 Total cash receipts													
26													
27 Operating costs, 5%													
28 Total costs													
29													
30 Net operating income													
31 Exclusive of construction loan interest													
32 Exclusive of annual loan servicing													
33 Plus reserve operating costs funded by construction loan													
34													
35 Pre-tax cash flow													
36													
37													
38													
39 Tax costs													
40 Net operating income													
41 Exclusive of interest charges													
42 Exclusive of depreciation													
43													
44 Taxable incomes (losses)													
45 Exclusive of passive losses of the past year													
46													
47 Taxable incomes													
48 Transfer of passive losses to future periods													
49													

Development period				Investment period									
50 Taxes													
51													
52													
53 Pre-tax operating cash flow													
54 Pre-tax cash flow													
55													
56													
57 After-tax cash flow													
58													
59 Sale price calculation		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
60													
61 Sale price at the end of Year 9 based on 10-year NOI, 8,5 %													
62 Exclusive of commission charges, 4,0 %													
63 Corrected sale price													
64 Exclusive of mortgage loan balance													
65 Pre-tax sale cash flow													
66													
67 Taxes													
68 Corrected sale price													
69 Exclusive of balance cost													
70 Total capital growth													
71 Exclusive of passive losses over future periods													
72 Total capital growth after cover of past-year losses													
73 Total accumulated depreciation													
74 Deterred tax, 25%													
75 Capital growth													
76 Capital growth tax, 20%													
77 Total sales tax													
78 Pre-tax sale cash flow													
79 After tax													
80 After-tax sale cash flow													
81													

Development period				Investment period									
82													
83 Return analysis	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
84 Property capital (losses)													
85 Cash receipts from long-term loan refinancing													
86 Pre-tax operating cash flows													
87 Pre-tax sale cash flow													
88 Total pre-tax cash flow													
89 Pre-tax IRR													
90 Property capital (losses)													
91 Cash receipts from long-term loan refinancing													
92 After-tax operating cash flow													
93 After-tax sale cash flow													
94 Total after-tax cash flow													
95 After-tax IRR													

[1]unpaid long-term loan balance was calculated with account of costs and cash flow. Only construction loan interest will be charged over the development period. Depreciation (refund) is backed by the long-term loan financing during the sustainable operating period.

[2]depreciation base is total project cost exclusive of land value and losses over the lease-out period. Balance cost includes land costs. In the instant case proprietary assets are included in depreciation base calculations. This is done to simplify the calculations. Otherwise, it could be calculated separately. Besides, when the construction is completed, office may start their operation at different time. To consider these details, an individual calculation table must be drawn up. It is unpractical to do it at the second stage as the data are too rough.

[3]reserve operating costs comprise funds necessary to cover operating costs and taxes during the rental period.

Stage 4. Annual cash flows over the development period. Stage 4 of the analysis (not described here) covers only the development period and gives more accurate predictions of cash flows necessary to apply for a construction loan. This stage is similar to the quarterly data analysis without monthly forecasts. Previous to that, a provision was made for the project to be complete within four quarters with another four quarters for the building lease-out. The predicted lease-out period (12 months) was calculated based on the expected office lease-out rate which was estimated by marketing research. The project achieves its sustainable occupancy at the end of the second year. The main goal of the monthly analysis of the development period is to estimate the loan amount which is needed to

pay such costs as interest taxes and operating losses over the construction and commissioning periods. Based on the quarterly cash flows given in Table 2.10, total project cost is evaluated (line 51). Provided the cash flows are positive after the interest charges have been paid, total project cost after one operating year will be consistent (line 53). The project cost is the same at the end of the second year (Table 2.21).

Table 2.21. Total project cost after one year

Long-term mortgage loan	
Property capital	
Total financing	
Exclusive of cash receipts from loan refinancing	
Total capital expenses	
Plus operating cash flow after the interest charges have been paid (line 14)	
Total project cost after one year	

Monthly analysis at the fourth stage enables a more accurate evaluation of these data. Often developers do not go beyond Stage 3 and suppose the quarterly cash flow analysis to clarify their financing needs. However, quarterly predictions serve only as guidelines, they provide detailed data about the financing needs for both developers and loan suppliers and serve as a useful tool of cash flow control after the construction has started.

Stage 5. Discounted cash flow analysis for investors: joint venture analysis. Stage 1, 2 and 3 feature a real estate project as a whole. It is considered that property capital and all future cash flows are invested or transferred to the developer which is also the owner. The final analysis stage divides all cash flows into groups, i.e. those of investor and developer. Stage 5 is the joint venture analysis. Its main objective is to identify which share of the property capital belongs to the investor and the developer respectively. The developer uses Stage 5 to determine the best combination of preferred income, profit distribution and the property capital needed for the project (Gallinelli 2008). Before final decision-making the developer may try out various deal options. As property capital investors prefer various contractual terms and conditions, the final contract version depends on the investor that is chosen by the developer to provide property capital. Before the project proposal is submitted to prospective investors, the final analysis at the fifth stage is carried out by accountants based on the after-payment figures. Simultaneously, the developer analyses pre-payment IRR cash flows. The project feasibility is reliant upon the sufficient property capital amount, therefore the investor's IRR is one of the main important characteristics when calculating the payback.

The fifth stage of analysis should precede the non-refundable pre-payment in accordance with the sale and purchase agreement. If the investor's IPR is less than 15% (if inflation is higher than 3–4% or the deal is very risky), the land plot value or the purchase price is too high. As an alternative, the investor could receive a bigger income share. However, is the remaining income seems to be too low for the developer, the deal should not be closed.

Table 2.21 shows the fifth stage of analysis of the pre-tax indexes forecast. In the calculations, cash flows (line 11) are taken from the overall analysis of the third stage (Table 2.19, line 88). Although at the fifth stage the analysis is done by cash flows of the third stage, it can be easily linked to the second stage of the analysis. In this case pre-tax cash flows of the second stage are used at the fifth stage as well (Table 2.15, line 11). The property capital investor most often will required the preference payback. The preference payback is more likely to be an accumulated (increasing) one, i.e. if there are no sufficient payback funds, the preference payback is added to the investor's property capital and interest is charged. In this case the investor receives some 8% of the remaining cash receipts and 80% of the remaining cash flows as reimbursement of the property capital investment. The rest of 20% is equally distributed between the developer and the investor. When the property is sold, the unpaid property capital and unpaid (accumulated) preference income are compensated before everything else. Then the remaining amount is divided in the ratio of 60/40. The investor takes 60% and the developer gets 40%. According to these contractual terms, the developer receives certain cash flows over the operating period. Some investors may insist on taking all cash flows before they get the invested capital and preference income. There are no standard conditions for a deal. They depend on the developer and the well-thought pattern of development that is likely to attract needed property capital.

If one large investor is to join the deal, the detailed terms and conditions are agreed upon by the investor and the developer exclusively. Institutional investors of property capital usually require 75–80% of the income. Developers can often receive funds from private persons at lowered interest rates. In 1980 the following pattern of private deals became very wide-spread in the US: 6–10% of preference capital and income distribution after the payback of one half of the property capital, i.e. 50%/50% (Miles *et al.* 2007). When the real estate market experienced scarcity of funds in 1980–1990s, investors required 80–90% of the income. The IPR usually varied from 2 to 25%, thus the investors received their 20–25% before the developer got his income share. This payback rate is very difficult to achieve except for the cases when the property is purchased at a highly discounted price or the project is extremely efficient. Therefore a required deal period should be 2–3 years. When the funds became more available in the mid-1990s the conditions of investors were not that strict. However, most investors

lost their money by investing in real estate. Nowadays, developers find it even more difficult to insist on traditional deal conditions, i.e. 50/50% of the income.

Financial analysis is an indispensable tool but it is used in an improper way rather often. Experienced developers sometimes disregard the state-of-the-art methods of IRR and DCF calculation as the old "rule of thumb" is very efficient for useful projects (the rule supposes capitalized value to be sufficiently higher than the project cost, e.g. by 15–20% or the actual project payback must be 10–11%). The project payback can be reevaluated at the second stage of the project. Developers must watch out to avoid the following mistakes:

1. Cost reduction.
2. Rental fee overestimation.
3. Heavy cuts of operating costs, in particular, after 5 years of operation.
4. Underestimation or refusal of investment reserve.
5. Underestimation or ignorance of the costs caused by changing office holders, e.g. new whitewashing, replacement of carpets, curtains, appliances.
6. Overestimation of rental fee growth.
7. Reduced capitalization rate in the sales year (it increases the value).
8. Reduced interest reserve over the rental period or wrong rental period.

Often the analysis errors are caused by natural optimism of the developer, i.e. several simultaneous optimistic or aggressive assumptions. If you make one optimistic assumption, e.g. a very short rental period, it won't have any strong effect on the results. However, two or three similar erroneous assumptions will result in a too optimistic and unfeasible payback. For instance, if the probability of each of these assumptions is 25%, so the cumulative probability of the assumptions is 1.5% ($0.25 \times 0.25 \times 0.25\%$). Therefore, the developer must be very thorough about making assumptions based on average data or their probability.

Another common mistake is too detailed analysis at the first stage. Monthly cash flows should not be analyzed when the project is considered for the first time because costs and rental fees can be assessed only very roughly so that detailed elaboration will be of no assistance. The detailed elaboration can even impede proper interpretation of data when making decisions. The fundamental rule of financial analysis is that the level of details should not exceed the accuracy of analyzed data. So, monthly cash flows of the fourth stage are analyzed only after the most reliable data about operating and development costs have been collected. Before that a detailed analysis is a pure waste of time.

Finally, a developer must always be savvy. Different payback indexes must be combined with the conventional "rule of thumb" (Table 2.22.). Good projects usually yield good payback indexes although they may differ depending on risk level, actual interest rates and inflation rate (Frej, Peiser 2004).

Table 2.22. Stage 5: discounted cash flow analysis, investor's payback

3 Initial property capital										
4 Accumulated preference payback, %										
5 Priority payment of the investor's property capital, %										
6 Remaining investor's cash flow, %										
7										
8	Development period			Investment period						
9	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
10										
11Pre-tax cash flow										
12										
13 Preference payback										
14Beginning remaining property capital										
15 Received preference payback										
16 Paid actual preference payback										
17										
18 Account of unpaid preference payback										
19 Beginning balance										
20 Deferred preference payback										
21 Paid deferred preference payback										
22 Ending balance										
23										
24 Account transactions of property capital										
25Beginning account balance										
26 Property capital payback										
27 Ending balance										
28										
29 Payments from property capital										
30 Paid actual preference payback										
31 Paid actual preference payback										
32 Property capital payback										
33 Total payments from property capital										
34										
35 Cash flow balance										
36 Pre-tax cash flow										
37 Total payments from property capital										

38 Cash flow balance										
39										
40 Investor's share of cash flow balance										
41										
42 Investor's receipts from cash flow										
43 Investment										
44 Total payments from property capital										
45 Investor's share of cash flow balance										
46 Pre-tax cash flow of investor (4546115)										
47										
48 Pre-tax IRR of investor										
49 Net actual cost at 15.00%										
50										
51 Developer's cash flows										
52 Pre-tax cash flows of developer										
53										
54 Net actual cost at 15.00%										
Discount rate										

These "rules of thumb" serve as guidelines only. Payback can vary depending upon a particular deal risk, overall economic situation and geographical location. Payback indexes can also change in relation to inflation and interest rates. In case of increasing interest rates the expected payback index will more likely reflect the historical relations mentioned above. Financial analysis is an iterative process. The second stage of analysis is done repeatedly in order to collect more accurate and updated information about the project. After a model has been created, little time is needed to input the refined data and make calculations. It is necessary to make sure that the assumptions and outcomes make good sense. A simple calculation method can be applied based on the actual income and capitalization rates. However, the complicated calculation methods should be avoided as main essential parameters can get lost on the numerous pages of the analysis.

Each stage of the economic feasibility analysis requires decision-making regarding the project, i.e. whether it should be carried on or stopped. The decision to carry on does not commit the developer to start the construction but brings the developer onto another level of investment and risk. Each level may require many or few obligations. For instance, some projects may have all necessary approved project documents and the developer could apply for a construction permit as soon as funding agreement is concluded and payments from construction loan are planned. Other project can require certain investment to explore

the possibilities, as all physical characteristics of the land plot are available, the loan supplier evaluates the project, while the market has been analyzed already and no preliminary engineering works are needed or the architect has delivered the sketch drawings with specifications.

Table 2.23. Return index by conventional rules

Return index	New development, %	Sustainably operating property, %
Actual return (intermediate cash flow/property capital)	8–10	8–10
Total return (general capitalization rate: GVP/ total project value)	10–11	9–10
Non-leverage IRR exclusive of long-term financing	12–15	10–12
Pre-tax leverage IRR inclusive of long-term financing	20–25	15–20
After-tax leverage IRR inclusive of long-term financing	15–20	12–15
Pre-tax IRR of investor	16–20	14–18

The significance of initial cost containment can hardly be overestimated. These are very risk-bearing activities because the probability of project continuation is very small even if the real estate developer has done the non-refundable pre-payment for land purchase. The success formula lies in proper understanding of what information is needed and how it can be received in a cost-effective way. The developer should balance between waste of funds and insufficient feasibility study if he wants to evaluate the property as required. Two most important decisions, in particular for real estate developers with limited resources, include land purchase and construction start; moreover, both decisions imply the biggest financial obligations. DCF analysis provides data that affect the decision-making process regarding the land purchase. These are determined by expected income, IPR, necessary funding amount, property capital, financial obligations period. It is understood that decision of land purchase is not made on the DCF analysis alone. The developer should evaluate other investment possibilities, risk degree and search for the answers to the following questions:

1. Does the developer have sources of property and long-term capital needed to implement the project?
2. Is it the project that the developer is ready to spend three or more years on?
3. Is the project worth the developer's time, efforts and risks?

4. Will the developer be able to overcome many unforeseen difficulties and delays incurred in the project? If he is not able to do so, is it worth taking the risk of losing all the assets?

2.4. Retail property and hotel development

2.4.1. Classification of hotels

Building of new hotels or reconstruction of the old highest-class ones, their equipment and operating costs are considered to be risky investments because the project costs are several times as high as those of trendy shopping centres or office centres. Besides the payback periods of five-star hotels are very long, therefore income generating properties market gravitates towards low-cost hotels and lower capital.

The following hotel classification providing detailed description of each class has become globally accepted.

De-luxe hotel. By its size this hotel type is classified as small- or medium-size business. It is usually located in the city centre. Well-trained personnel provide high-level service meeting the needs of the most demanding clients who typically are conference participants, business people, and highly-paid professionals. The hotel rooms are high-cost; all types of services are rendered (Hotel typology 2007).

Mid-range service hotel. By its size this hotel is a larger one (400–200 beds). It is located in the city centre or within the city boundaries. The hotel renders a wide range of services, the room prices are equal or slightly above those common for the region. The hotel targets business people, individual tourists, participants of conferences and conventions, etc.

Apartment hotel. By its size the hotel is small or medium (up to 400 beds). It is typical of the city with variable population. The apartment hotel serves as a temporary residence and offers self-catering service. The room prices usually vary depending on the duration of stay. The hotel caters to longstayers such as tourist families or business people.

Budget hotel. This hotel is a small- or medium-sized business (150 beds or more). It is typically located close to highways and offers basic and simple minimum services. Budget hotels appeal to business people and individual travelers who want a room with minimum services and amenities required for comfortable stay, without unnecessary paying additional cost for costly services (Hotel typology 2007).

Resort hotel. The size of such hotel may vary; they usually render a full range of hospitality services. In addition, guests can enjoy special health services and diet food. The hotel is usually located in resort locations.

Motel. It is a low-rise construction (one or two floors) located out-of-town, along highways. By it size it is small- or medium-sized business (up to 400 beds). The small number of personnel provides middle-class servicing. The motels target different types of travelers with a special focus on motorists (Hotel typology 2007).

Private B&B hotel. It has become very wide-spread in the US. It is a small-sized (sometimes medium-sized) hotel in the out-of-town or countryside area. The standard services include breakfast and early buffet supper in a homely atmosphere. The B&Bs appeal to business people and tourists seeking homely comfort.

Garni hotel. The hotel offers limited services to include accommodation and continental breakfast.

Boarding house. The boarding houses provide limited services. In contrast to garni hotels guests are served breakfast, lunch and dinner (full board), meals to be provided only for the stayers.

Guest house. As opposed to hotels, the guest houses provide only basic services and small number of beds (the number of beds is usually smaller than that of the hotels). The guest houses do not dispose of public spaces such as lobby or meeting rooms. A restaurant or a bar is usually available for guests.

Rotel. This is a rolling hotel which is a caravan with single or double compartments equipped with sleeping couchettes. There are clothes-changing compartments, a bathroom, a kitchen and a fridge (Hotel typology 2007).

Boatel. It is a small ship or a boat normally moored at a pier and used as a hotel (Hotel typology 2007).

Floatel. It is a large hotel, frequently described as a "floating resort". The guests are offered comfortable rooms and a wide range of services to include a swimming pool, water ski, fishing tackles, scuba diving and underwater fishing equipment, fitness rooms, conference and convention halls, library and other services (phone, fax, teletype, TV, etc.). Recently, the floatel haave been widely used for business travel, conference tours, convention cruises, education tours (Hotel typology 2007).

Flytel. It is a flying hotel which is an extremely expensive and rare hotel type. The flying hotel is equipped with a landing pad and meteorological service communication (Investment and construction engineering 2008).

The Table 2.24. features rough characteristics of hotels based on hotel ratings (one- to five-star hotels).

Table 2.24. Rough characteristics of hotels (The "+" sign shows obligatory requirements)

Requirement					
	*	**	***	****	*****
1. building and the surrounding areas					
Sign board:					
illuminated or fluorescent	+	+	+	+	+
Guest entrance					
other than staff entrance			+	+	+
with a canopy to protect from atmospheric precipitation on the way from the car				+	+
air and heat curtain				+	+
entrance to a restaurant (café, bar) from the lodging facilities		+	+	+	+
2. technical facilities					
Emergency lights and energy supply					
emergency lights (accumulators, lanterns)	+	+	+	+	+
stationary generator ensuring key lighting and main equipment operation (incl. lifts) 24 hours at a minimum			+	+	+
Water supply:					
hot, cold	+	+	+	+	+
hot water supply by reserve hot water supply system in emergency cases or preventive maintenance			+	+	+
water treatment unit to provide potable water				+	+
bottled drinking water in rooms (free)	+	+	+		
Full year-round air conditioning				+	+
Internal radio broadcasting in all spaces including lifts				+	+
Hotel lift:					
more than five floors	+	+			
more than three floors			+		
more than two floors				+	+
personnel lift, baggage lift (or hoist lift)				+	+
Lift wait (if applicable):					
maximum 45 sec.			+		
maximum 30 sec.				+	+
24-hour lifts (if applicable)	+	+	+	+	+
Room telephone:					
internal (hotel restricted extension) or staff call-button in all rooms	+				
internal in all rooms		+			
internal and urban in all rooms			+		
internal, urban, national and international in all rooms				+	+
Collective-use phones in public spaces (lobby) in telephone boxes or under acoustic caps:					
urban, national and international				+	+
3. HOTEL ROOM CAPACITY					

Requirement						
Single / double rooms minimum:						
25%		+				
50%			+			
100%				+	+	+
Suites or adjoining rooms				+		
Suites					+	
Suites and adjoining rooms						+
Suites – minimum 5% from total hotel room capacity мера						+
The room area should enable guests to move freely, comfortably and safely and to use all equipment and furniture		+	+	+	+	+
Room area (without bathroom, loggia, balcony), m^2, min.						
studio single	studio double					
9	12	+	+	+		
12	15				+	
14	16					+
Rooms for large number of guests must have an area based on each guest, m2, minimum:						
– 6 – for year-round lodging facilities;		+	+			
– 4,5 – for seasonal lodging facilities		+	+			
Bathroom (wash stand, toilet bowl, bath-tub or shower)						
minimum 25% of rooms		+				
minimum 50% of rooms			+			
100% of rooms				+	+	+
Bathroom area, m2, minimum:						
1,75		+				
2,5			+	+		
3,8					+	+
4. EQUIPMENT						
Security alarm, electronic locks and / or video surveillance in corridors					+	+
Noise insulation:						
Improved, with noise level less than 35 DB					+	+
Heating		+	+	+	+	+
Cooling fan (in hot regions)		+	+	+		
Thermostat for individual temperature control					+	+
5. SANITARY FACILITIES IN PUBLIC SPACES						
Lavatories:						
shared lavatory, one per 20 people accommodated in rooms without lavatory, minimum two per one floor		+	+			
nearby public spaces		+	+	+	+	+

Requirement					
Lavatory facilities: toilet stalls, wash stand with a mirror, electrical socket, toilet paper, soap, loop or paper towels (or hand-driers), clothes hook, wastebasket	+	+	+	+	+
Shared bathroom or shower room, one per 30 people accommodated in rooms without bath or shower	+				
Shared bathroom or shower room, one per 20 people accommodated in rooms without bath or shower		+			
Bathroom / shower room facilities: bath-tubs, shower stalls, toilet stall, wash stand with a mirror and toiletry shelf, clothes hooks, wastebasket	+	+			
6. PUBLIC SPACES					
Public spaces must have furniture and other equipment according to the functional purpose of the hotel	+	+	+	+	+
Lobby area 10 minimum:					
9 m^2 plus 1 m^2 per each room starting from room 21, maximum area not more than 25 m^2	+				
20 m^2 plus 1 m^2 per each room starting from room 21, maximum area not more than 40 m^2		+			
30 m^2 plus 1 m^2 per each room starting from room 21, maximum area not more than 80 m^2			+		
30 m^2 plus 1 m^2 per each room starting from room 21, maximum area not more than 120 m^2				+	
30 m^2 plus 1 m^2 per each room starting from room 21, maximum area not more than 160 m^2					+
Reception and accommodation services with sitting and waiting area	+	+			
Reception and accommodation services with sitting and waiting area with appropriate furniture (armchairs, sofas, chairs, coffee tables) with newspapers and magazines			+	+	+
with drinks and music				+	+
Carpets, carpeting or other flooring in the sitting area			+	+	+
Ornamental greening, design structures, music			+	+	+
Individual safe deposit boxes for safekeeping of guests' valuables			+	+	+
Cloakroom nearby public spaces				+	+
Coat hangers in the lobby and public spaces	+	+	+	+	+
TV hall	+	+			
Conference hall with necessary facilities					+
Business centre (electronic communication means, copy machines, meeting rooms, computers)				+	+
Fitness centre with a gym				+	+
Swimming pool					+
Swimming pool or sauna with a mini-pool				+	
Carpeting (carpets) in the corridors			+	+	+
Medical station					+

Requirement					
Shops and booths				+	+
7. CATERING SERVICES					
Restaurant or other catering facilities		+	+		
Restaurant				+	+
several halls				+	+
banqueting facilities possible to transfer to a conference hall				+	+
night club / bar				+	+
Café / bar				+	+
8. SERVICES.					
Reception service – 24 hours In holiday hotels, boarding houses and similar lodging facilities the reception service may be reached 24 hours. For health-improvement lodging night receptionists may be replaced by medical staff providing emergency care	+	+	+	+	+
Mail delivery to guests	+	+	+	+	+
Guest search service				+	+
Doorman				+	+
Porter (car-to-room baggage delivery) 24 hours:					
obligatory				+	+
on request		+	+		
Wake-up call (on request)	+	+	+	+	+
Daily cleaning services including bed-making	+	+	+	+	+
Turndown service				+	+
Bed-clothing change:					
every five days	+				
every three days		+	+		
every day				+	+
Towels change:					
every three days	+	+			
every day			+	+	+
Laundry:					
within a day			+	+	+
express-laundry					+
Ironing:					
within one hour				+	+
delivery of iron and ironing board	+	+	+		
Dry-cleaning (dry-cleaning services may be provided by a contracted dry-cleaner's) :					
within one day			+	+	
express-servicing					+
Minor repair of clothes			+	+	+
Shoe brush machine			+	+	+
Mailing and telegraph services			+	+	+

Requirement					
Telex / fax sending and delivery				+	+
Safekeeping of valuables at the reception desk	+	+	+	+	+
Baggage storage	+	+	+	+	+
Currency exchange or acceptance of card payments			+	+	+
Transfer services (airport or railway station transfer, etc.)				+	+
Taxi calling services			+	+	+
Car rental services				+	+
Booking and/or selling of travel tickets				+	+
Booking and/or selling of theatre, sporting events or show tickets				+	+
Tourist services:					
tourist information			+	+	+
excursions, guide-interpreters				+	+
Medical services: emergency calls, first-aid kit	+	+	+	+	+
9. FOOD SERVICES					
Meals:					
various meal plans (breakfast only, half-board, full-board)			+	+	+
breakfast (7.00–10.00)		+	+	+	+
24-hour meal service					+
Room service:					
during breakfast hours			+		
24 hours				+	+
breakfast menu in the room			+	+	+
10. PERSONNEL QUALIFICATION REQUIREMENTS					
Written code of conduct for personnel describing their job functions and established workplace policies	+	+	+	+	+
Qualification: managers and personnel must have adequate qualification (complying with occupational standards) that is specified by travel industry standards – Hotel Sector	+	+	+	+	+
Personnel appearance:					
Uniform, identification badges		+	+	+	+

2.4.2. Retail property classification

Retail property classification should include the following parameters (Jun *et al.* 2011; Raslanas, Lukosienė 2013):

– market size, common names;
– product lines;
– main consumers;
– infrastructure and services, additional customer attraction points;
– location;

– structural concept, architecture and finishing, planning concepts;
– parking area;
– property management, security.

Table 2.25. Retail property classification

Type index	Class	Description	
		Parameter	Characteristics
1	Class 1	Market size, common names	Shopping complex (SC), shopping and leisure centre (SLC), shopping centre (SC), megamall, hypermall
		Product lines	Mixed – all product lines (without elite products)
		Infrastructure and services, attraction points	Maximum wide range of additional services, including entertainment (entertainment centres, multiplexes, food courts, funfair, bowling, children's playground, skating rink, inside shuttles, free delivery and installation of large household appliances, office areas and hotels, etc.)
		Location	Close to railway or bus stations, on the traffic arteries, with convenient access by car, subway and public transport
		Planning concepts	Optimum (atrium, galleries, halls, escalators)
		Structural concept, architecture and fininshing	Modern complex of permanent structures of stylish architecture that matches the surrounding built-up areas. High-quality finishing by bright plastic, glass, synthetic materials
		Parking area	Secured parking spaces (minimum 1 per 1 m^2 of retail area)
		Property management	Professional management complying with international standards Professional experienced leaseholder. The building is perfectly maintained, it has own security, management and maintenance services. Legal documentation of ownership and operation rights.

Type index	Class	Description	
		Parameter	Characteristics
2	Class 2	Market size, common names	Shopping complex (SC), shopping centre (SC), hypermarket
		Product lines	Mixed – all product lines (without elite products)
		Infrastructure and services, attraction points	Middle class
		Location	Additional services (dry cleaner's, photographic cabin, ATM, currency exchange, bar, café, hairdresser's, solar studio, pharmacy booth, gift-wrapping services, acceptance of credit cards, children's playroom, free delivery and installation of large household appliances, etc.)
		Planning concepts	Located on main squares and traffic arteries, with convenient access by car, subway and public transport
		Structural concept, architecture and fininshing	Modern complex of permanent structures or one building of stylish architecture that matches the surrounding built-up area. High-quality finishing by natural and synthetic materials, Planning concepts (atrium, galleries, halls, escalators)
		Parking area	Secured parking spaces
		Property management	Professional management complying with international standards Professional experienced leaseholder. The building is perfectly maintained, it has own security, management and maintenance services. Legal documentation of ownership and operation rights.
		Market size, common names	Supermarket, convenience store
		Product lines	All-purpose products – all lines of food or consumer goods (from mass to elite)
		Infrastructure and services, attraction points	Middle and above-middle class, employees of foreign companies and organizations

Type index	Class	Description	
		Parameter	Characteristics
3	Class 3	Location	Additional services (currency exchange, bar, café, pharmacy booth, gift-wrapping service, acceptance of credit cards, allied products, etc.)
		Planning concepts	Located on traffic arteries and squares, convenient access, heavy pedestrian traffic (frequently visited places)
		Structural concept, architecture and fininshing	Modern permanent structure or part of the building (ground floor). Quality renovation and finishing. Convenient operation of consumers' streams
		Parking area	Parking spaces available
		Property management	Management complying with international standards; professional experienced leaseholder; legal documentation of ownership and operation rights
4	Class 4	Market size, common names	Showroom, furniture shop, appliance store, toy store, etc.
		Product lines	Combined – several product lines of similar demand
		Infrastructure and services, attraction points	Middle and above-middle class, employees of foreign companies and organizations
		Location	Several additional services (currency exchange, acceptance of credit cards, allied products, etc.)
		Planning concepts	Located on traffic arteries and squares, convenient access, heavy pedestrian traffic (frequently visited places)
		Structural concept, architecture and fininshing	Modern permanent structure or part of the building (ground or basement floor). Quality renovation and finishing. High-tech, modern styles, modern materials. Convenient operation of consumers' streams
		Parking area	Parking spaces available
		Property management	24-hour security; good maintenance service; professional leaseholder

Type index	Class	Description	
		Parameter	Characteristics
5	Class 5	Market size, common names	Department store, grocery stores, pharmacies, consumer goods stores, foodstores, etc.
		Product lines	All-purpose or specialized product lines, medium or low prices
		Infrastructure and services, attraction points	Area residents
		Location	
		Planning concepts	Located on traffic arteries and squares
		Structural concept, architecture and fininshing	Ground floor of residential or office buildings or detached building. Standard cosmetic repair
		Parking area	No requirements
		Property management	24-hour security; good maintenance service; experienced leaseholder
6	Class 6	Market size, common names	Pavilion, booth
		Product lines	Specialized or niche products of low prices
		Infrastructure and services, attraction points	Subway passengers, passers-by, tourists
		Location	
		Planning concepts	At subway stations, on the streets and squares, pedestrian tourist routes
		Structural concept, architecture and fininshing	No requirements
		Parking area	No requirements
		Property management	No requirements

Type index	Class	Description	
		Parameter	Characteristics
7	Class 7	Market size, common names	Pavilion, booth, glass booth
		Product lines	Specialized or niche products of low prices (including cheap imported goods and fake goods)
		Infrastructure and services, attraction points	Area residents, retired people, low-income population groups
		Location	No requirements
		Planning concepts	Inside a residential district, yard, in the marketplace
		Structural concept, architecture and fininshing	No requirements
		Parking area	No requirements
		Property management	No requirements
8	Class 8	Market size, common names	Boutique
		Product lines	Niche products of one world-class brand, the highest prices
		Infrastructure and services, attraction points	Elite
		Location	No requirements
		Planning concepts	On the streets and residential areas of exclusive development
		Structural concept, architecture and fininshing	Small-size premises in exclusive buildings, exquisite classic, natural materials
		Parking area	Parking spaces available
		Property management	Professional management, 24-hour security, video surveillance

Type index	Class	Description	
		Parameter	Characteristics
9	Class 9	Market size, common names	Non-residential premises of free purpose
		Product lines	Not specified
		Infrastructure and services, attraction points	Not specified
		Location	Not specified
		Planning concepts	Various
		Structural concept, architecture and fininshing	Ground floors and basements of residential buildings. More or less quality repair. Shop-windows
		Parking area	No requirements
		Property management	No requirements
10	Class 10	Market size, common names	Non-residential premises of free purpose
		Product lines	Not specified
		Infrastructure and services, attraction points	Not specified
		Location	Not specified
		Planning concepts	Various
		Structural concept, architecture and fininshing	Ground floors and basements of residential buildings. reconstruction and repairs needed.
		Parking area	No requirements
		Property management	No requirements

Based on the above listed parameters the following retail property classes can be identified:

1) I – shopping complexes, shopping and leisure centres, shopping centres, megamalls, hypermalls;
2) II – shopping complexes, shopping centres, hypermarkets;
3) III – supermarkets and convenience stores;
4) IV – showrooms, furniture shops, appliance stores, etc.;
5) V – department stores, grocery stores, pharmacies, consumer goods stores, etc.;
6) VI – pavilions and booths;
7) VII – pavilions, booths, glass booths;

8) VIII – boutique;
9) classes IX and X include non-residential areas of free purpose, i.e. ground floors and basement floors of residential buildings. They differ in the quality of repair. A more detailed classification is given in Table 2.24.

2.5. Specific features of retail property and hotel development

Today the hotel market suffers from lack of development experience of hotel projects. Hotel business is capital intensive and requires considerable knowledge and experience that many local developers do not possess. Moreover, depending on the construction facility size, its quality and general market conditions, the payback period may vary from 7 to 14 years, whereas other real sectors offer more favourable conditions of return on the investment.

Main specific feature of hotel development is to a large extent the unique character of each project, in particular high-class hotels. The warehouse complexes can be standard as well as residential buildings, however, standard high-class hotels are considered to be a negative tendency (Jun *et al.* 2011).

According to the global practice, key factors of commercial effectiveness of hotel development project are well-thought concept and proper operating management.

Most developers face the challenge of highly sophisticated and comprehensive hotel project implementation, as compared to other real estate sectors, and therefore prefer to apply to specialized property management companies.

In case of *retail property*, the key factor of site selection is location along traffic arteries and population streams, i.e. highway crossings, close proximity of railway and bus stations, subway stations as these are ideal locations for shopping and hotel complexes. Environmental issues in this instance are of no practical importance. Availability of the parking area and convenient access roads is crucially important.

In terms of marketing, focus on a balanced leaseholder team is essential as this will enable the shopping complex to craft an image of a single complex with adequate service and quality of goods and services.

Architectural concepts must provide for hospitability of the shopping complex and availability of window cases.

The funding model of shopping complexes is similar to that of office buildings construction.

Case study. Development project of multipurpose shopping complex

The project envisages construction of a multipurpose shopping complex with the city bus station, at the entry way to the centre of the city N. The concept of shopping and leisure centre (further referred to as SLC) targets middle-income

customers and is designed to retail selling of foodstuffs and consumer goods as well as for entertainment and leisure purposes. The SLC target groups are car-owning families therefore a land plot close to the highway has been selected as a construction site.

The shopping and leisure centre is going to accommodate:

– a supermarket;
– large appliance stores, clothes and shoe shops, perfumery and cosmetics shops, household goods stores, etc.
– restaurants, cafés, bars;
– a children's entertainment centre;
– bowling;
– a two-hall cinema;
– billiards and slot machines
– a spa centre;
– a beauty parlour;
– a city bus station;
– VIP-offices and hotel rooms.

The SLC building is a unique architectural five-block complex to include:

– block 1 – office and hotel complex – an 11-floor futuristic-style building with a total area of 27,000 m^2;
– block 2 – a city bus station with shops, booths and cafés – a four-floor building with a total area of 4,450 m^2;
– block 3 – a consumer goods shopping centre – a four-floor building with a total area of 23,500 m^2;
– block 4 – a four-floor shopping complex with three shopping halls for consumer goods and foodstuffs with a total area of 15,150 m^2;
– block 5 – an entertainment centre for children and adults – a four-floor building with a total area of 8,000 m^2.

The total area of the shopping and leisure centre covers 78,100 m^2, including usable area of 70 898 m^2, i.e. 90.8%. The building volume is 498,100 m^3.

The built-up area comprises 23,320 m^2 with the enclosed court and 19,720 m^2 without it. The land plot where the shopping and leisure centre project is to be developed occupies an area of 4,5 ha and is owned by physical persons.

The parking area of 500 parking spaces is designed close to the building, as well as visitor parking and a roofed boarding platform of the bus station.

The SLC blocks will be linked by pedestrian first-floor esplanades. The shopping and leisure centre is to be constructed in three phases:

1) block 4 (shopping complex) and block 5 (entertainment centre);
2) block 3 (shopping complex) and block 2 (bus station);
3) block 1 (office and hotel complex).

The "Customer JSC" company has evaluated the investment prospects in the city N and is planning to sell a certain part of areas after each phase is completed. The remaining areas will become company's assets and leased out.

The full project implementation envisages:

– selling of the area of 45,170 m^2;

– leasing of the area of 25,728 m^2.

Key buyers and lessees are supposed to be large "anchor" operators in the retail and entertainment sphere that are leading agents of their leagues.

2.6. Warehouse and industrial development

2.6.1. Classification of warehouse property

There is no single, globally recognized warehouse classification but the classification developed by Swiss Realty Group in 2004 is undoubtedly the most popular with real estate professional and the most suitable to the actual Russian reality (Classification of Warehouses 2014).

The company outlined seven classes that are described in detail in Table 2.25. Class 1 ("A") includes modern premises that take into account future warehousing activities. Their location, finishing and equipment are designed to comply with the principles of modern warehousing logistics, such as proximity to main traffic arteries, easy adaptation to any product lines, speedy supply turnover and guarantee of goods safety.

Other classes refer to the premises that lack some of the parameters of class "A". Class 2 ("A-") includes fully reconstructed premises built 20–30 years ago. They have similar characteristics as Class "A" with the only difference in the location, i.e. they are often located within the city boundaries, in industrial zones.

Class "B+" refers to the premises built in the 1990s and not complying with two-three key parameters of Class "A" for several reasons (insufficient number of gates, inconvenient access ways, etc.). They are abundant on the market which can be explained by past chaotic growth of investment activity in the warehouse construction field.

Class 4 ("B") includes warehouses built in the 1970–1980s in conformity with the logistics rules that are typical of planned economy. They often need additional capital investment and reconstruction to optimize warehousing activity, i.e. change of flooring, installation of modern security systems, etc.

Class "C" refers to former industrial premises, taxi garages and motor depots that were initially designed for other purposes than warehousing. Such premises require considerable construction and engineering modification (cutting of additional gates, construction of loading ramps, slip roads, change of glassing and

stained-glass windows by permanent walls, upgrade of flooring, heating and fire-extinguishing systems).

Class 6 ("C-") includes old buildings of the 1830–1860s and rundown premises of the Soviet era (most vegetable storehouses and wholesale grocery facilities). They generally do not conform with modern fire safety requirements and supply turnover capacities and therefore need considerable capital investment in top-to-bottom renovation and modernization.

Class "D" refers to premises not adjusted to warehousing needs that from the profit-making point of view would be recommended to demolish and to replace by newly-built higher-class warehousing facilities.

Main requirements to Class "A" warehouses:

– Location close to major highways. Direct access to warehouse area by highway or convenient satellite roads.
– One-floor / single-space building with high ceiling enabling to install any racking (conveyor, etc.) equipment, including multistorey (mezzanine) racking systems.
– Flat anti-dust coated concrete floor ensuring high speed and traffic safety of cargo-handling machines.
– High projected floor surface load enabling heavy loader traffic (high rack stackers) with maximum use of racking height.
– Wide column spacing that allows variable rack locations and optimization of the traffic of machines and warehouse workers.
– One or more cargo-handling gates per each 1,000 m^2 of warehouse space, separate cargo-handling and order-batching zone enabling quickest possible handling works.
– Fire-alarm system and automated fire-extinguishing system (or possibility to install them).
– Self-contained heat and water supply systems.
– Cargo-handling gates equipped with hydraulic loading platforms and dock shelters (or possibility to install them).
– Surrounding grounds (maintenance buildings, internal roads, parking areas, U-turn zones, landscaping areas) of not less than 40% of the total warehousing area.
– Attractive appearance (modern façades, modern glassing).

Table 2.26. Classification and main characteristics of warehouse property (Warehouse Management Features 2014)

Description of warehousing facilities	Class A+ and A	Class B+and B	Class C	Class D
Type and layout of the building	One-floor warehouse building of a square shape made of light metalwork, sandwich panels, without columns or with column spacing of 9–12 m, with span of minimum 24 m	One-floor building, preferably of square shape, newly constructed or reconstructed, with sufficient number of cargo elevators / hoists (load-carrying capacity of minimum 3 t, one per 2,000 m^2)	Permanent industrial premises or cold-proof hangar, cargo elevators / hoists (if several floors)	Basement premises, civil defence facilities, non-heated industrial premises or hangar
Built-up area	40–45%	45–55%	Not defined	Not defined
Ceiling	Minimum 10 m for installing multilevel racking equipment	From 6 to 10 м	From 4 m	Not defined
Floor	Anti-dust coated concrete, minimum load of 5 t/m^2, 1.20 m above the ground	Asphalt or non-coated concrete	Asphalt or concrete tiles, non-coated concrete	Not defined
Heating	Controlled temperature conditions	Controlled conditions or heating system	Heating system	
Engineering systems	Ventilating system, self-contained electrical substation and heating unit		Ventilating system	
Supporting infrastructure	Offices and utility rooms in the warehouse, fibre-optical communications	Offices and utility rooms (lavatories, shower rooms, back rooms, etc.) in the warehouse, telecommunications	Offices and utility rooms, telecommunications	Offices and telecommunications
Fire safety	Fire alarm systems and automated fire extinguishing systems	Fire alarm and fire extinguishing systems (possibly automated)	Fire alarm and fire extinguishing systems	
Safety and security	Fenced, illuminated and 24-hour secured area, security alarm, video surveillance, employees access control and accounting systems	Security (possibly 24-hour) around the area, security alarm, video surveillance, employees access control and accounting systems	Security around the area	
Transport infrastructure	Railway access and location close to central highways	Railway access, preferably close to central highways	Railway access	
Parking and grounds	Parking and maneuvering areas for heavy trucks as well as car parking spaces	Parking and maneuvering areas for heavy trucks		
Cargo handling operations	Dock-type automatic gates with height-adjustable platforms (minimum one per 500–700 m^2)	Dock-type automatic gates with height-adjustable platforms (minimum one per 1,000 m^2) or unloading docks	Gates at ground level, unloading docks	Not defined
Management quality	Professional management system and an experienced developer	Professional management system, experienced developer advisable	Not defined	

2.6.2. Industrial property characteristics

Industrial property characteristics are shown in Table 2.27. Industrial-purpose facilities are usually composed of several main parts that are constituents of an integrated body operating for a long period of time (Methodical approaches… 2014).

Table 2.27. Industrial property characteristics

Industrial property type	Industrial property subtype	Facilities by industrial property type / subtype
Manufacturing buildings	Industrial buildings	Buildings of plants, factories, transport and energy companies, including manufacturing facilities of plants, mines and factories, workshops, garages, depots, compressor stations, etc.
	Agricultural buildings	Agricultural buildings Buildings for production purposes in agriculture, such as cow-houses, piggeries, poultry houses, grain and vegetable storage facilities, etc.
Engineering structures		Special-purpose structures, such as bridges, towers, dams, tunnels, water intake stations, sluices, piers, etc.
Industrial-purpose land plots*		Industrial land is land located outside settled areas that serves or is intended to serve business activities and/or the operation of industrial facilities and the accomplishment of other special objectives, with the rights to it determined.

An industrial complete-cycle enterprise (supplying finished products to the market) consists of the following basic components that can be subject to value appraisal when forming the price of industrial property:

– land plot;
– buildings and structures as a whole and their parts;
– internal communications (roads, water, gas and heat supply systems, canalization systems, conveyor galleries, machinery, assembly units, etc.);
– production facilities, machinery, assembly units, etc.;
– power supply units;
– transportation department facilities;
– administration and management unit with communication system;
– industrial safety system;
– individual waste treatment facilities;
– utility service, etc.

Changes of permanent structures are approved by state registration of the changes. A document approving the commissioning of a permanent structure is one of the authorization means of state registration of changes.

Often changes of permanent structures are done on an unauthorized basis. Afterwards the permanent structures or isolated premises operate for a long period of time. Eventually state registration of changes becomes indispensable. Usually this need is caused by the owner's decision to sell the property or for some trivial reasons such as neighbours' complaints. For instance, this may be the case when bearing walls are broken as a result of the changes and the building starts to decay.

In this case the owner faces a choice: whether to return the building to its original state or to "legalize" the changes of property by means of their state registration. In the latter case in order to shape the property, the state registration agencies inspect the characteristics of the building and of isolated premises by means of their examination and comparative checking of their condition. The inspection is to document the construction, extension, additional structures, reconstruction, destruction (demolishing) or wreck of buildings in the land plot; modified technical conditions due to repairs; altered plans of structures or isolated premises, including building or break of internal walls and partition walls, reconfiguration of interior spaces, building or closing of door and window openings, building or removal of wall built-in cabinets and ceiling cabinets, increasing or decreasing of the area of premises or the building as a whole; connection of buildings to urban networks (water supply, canalization, gas and power supply and other systems); change of designated use of the buildings and isolated premises due to their reconstruction; altered physical wear due to repairs, natural wear as well as changes resulting from improper operation, neglect, natural hazards or other impacts.

Buildings and isolated premises are considered to be conforming when no changes are registered as to their legal documents. In this case the term "inconsiderable changes" is applied.

Inconsiderable changes include:

- building (change of size or materials) or closing of door and window openings that do not affect the strength, stiffness and durability of permanent walls and other bearing structures, except for closing of window opening resulting in the altered purpose of the premise (e.g. living room – locker);
- demolition or building of non-permanent walls and partition walls in non-residential buildings and premises without separation or merger of isolated premises;
- finishing works, including change of flooring;
- rearrangement (building or breakdown) of built-in furniture, including stationary cabinets and ceiling cabinets as well as door leaves within a door opening;

– replacement or dismounting of gas or electric cookers, bath-tubs and other equipment.

2.6.3. Specific features of warehouse and industrial development

2.6.3.1. Warehouse development

Nowadays the warehousing property market is the most dynamically developing one in the commercial real estate sphere and this is a justifiable trend. Only a few years ago the office and retail property was prioritized by investors, its cost efficiency being much higher than that of the warehousing property. However, now we can observe a considerably increasing amount of the warehouse development projects.

Earlier the warehousing property sector was the most underdeveloped and closed one that prevented accurate data collection and market share evaluation. Over the past two-three years the warehouse property market has evolved and firmed up and it is becoming more and more transparent and civilized.

Warehousing property is one of the most promising and highly-sought investment sector of commercial property development that is growing along with industrial and retail property sectors. But it is a long way before the warehouse property market becomes saturated. There are still precious few offers of high-quality property on the industrial and warehousing market. Most investors and developers have already become aware of benefits and prospects of investment in warehousing property development despite long payback periods as compared to the office and retail property. Market experts predict rapid revitalization of this property market in the coming years.

Professionals consider blurred classification of warehousing premises, lack of common adequate quality standards, absence of civilized land market and shortage of land plots supported by good infrastructure to be the main barriers impeding the warehousing market development (Stupin 2004).

At present the warehousing property development is going two directions. On the one hand, the market is occupied by speculative investors who develop large projects targeting mostly Western leaseholders. On the other hand, large-scale warehousing construction is deployed by leading Russian manufacturers and networks (Stupin 2006).

2.6.3.2. Industrial development

Industrial development is the least developed commercial property development sector.

Nowadays the industrial property market can be described in the following way: this sector is mostly represented by low-quality premises, expectant owners, a large number of small leaseholders and non-production use of industrial

use. At present there are no clear definitions, characteristics and classification of industrial property.

Moreover it should be noted that a great amount of the industrial property is still in state hands. Public agencies do not ensure efficient utilization of industrial complexes but cause great difficulties in solving the problems. Apart from the state ownership, the largest owners of industrial property are still defence enterprises. This fact adds to the shortage of industrial premises as well.

Specific features of the commercial property market are such that as a rule new facilities are tailor-made and developed either in a completely new undeveloped area or on the basis of fully reconstructed facilities that were designed for other manufacturing purposes. Unoccupied industrial property to be sold on the market is much lesser in amount than the existing demand.

The analysis of the industrial development market shows that prospective customers who would like to acquire ownership of industrial facilities seek areas ranging from 500 to 15,000 m^2. A considerable demand is observed for high-class industrial complexes. Industrial premises of 1,000–5,000 m^2 enjoy the greatest demand however the supply of them is rather short. Areas of less than 500 m^2 are more promising in terms of rent as small manufacturer cannot afford to buy their own premises.

Prospects of industrial property development are guided by demand for industrial facilities that can be divided into three types:

1. Demand for premises and land for manufacturing purposes with or without changing the production lines.
2. Demand for industrial premises and land for non-manufacturing purposes.
3. Demand for industrial sites with adequate infrastructure and land category for the purposes of new development of industrial facilities.

In the context of modern economy that is characterized by process dynamics, an important feature of physical potential of real estate assets is their ability of self-development and recategorization (Maksimov 2003). This makes one of the essential tasks of development. Among other things, new demands are placed on space and layout design that must ensure reconfiguration of the interior spaces and change of their designated use – from shopping spaces to office areas and further to conference halls, etc.

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III. CRISIS MANAGEMENT IN CONSTRUCTION AND REAL ESTATE

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3.1. The role of real estate in a country's economy

The average GDP of the pledged part of the environment in the EU has totaled approximately 20 percent over the past five years.

The development of a built environment endeavors to satisfy people's needs, including their physiological, security and social needs as well as needs based on esteem and self-expression. These can be satisfied in a residential home, an educational office, a theater, hospital, library, sports complex or some other building. A resident wants his/her home to be in a convenient location with a good infrastructure at a low cost that is also comfortable and has low costs for upkeep. Furthermore the walls of the building should have good sound insulation along with an attractive and aesthetic exterior. A person is also concerned about the location of his/her residence – an ecologically clean place offering peace and quiet, convenience for shopping and getting to work or other desired destinations that also includes opportunities for pleasant interactions with neighbors.

The significance of a built environment is doubly greater than that of construction.

In recent years, the average GDP for the construction part in EU countries is around 6–13 percent (see Table 3.1). Meanwhile the GDP for the proportion of the built environment is approximately twice more than the narrowly defined construction category.

The numbers of jobs in the construction branch in EU countries comprise some 6–13 percent of all jobs. The number of jobs in the built environment proportion is double. In 2000 there were 900,000 persons employed in construction in Canada. There were 180,000 employed in the area of designing and engineering, 275,000 in the sector of construction materials and products as well as construction machinery and equipment and 400,000 in infrastructure supervision and property management. The employees performing jobs on their own accord in construction and structure supervision and property management of buildings should be added to the numbers of the others so employed, since they comprise about a third of all the jobs performed in the entire branch of construction and real estate.

3.1 Table. GDP by construction part %, in 2009

Country	GDP by construction part %	Country	GDP by construction part %
Austria	10.9	Ireland	12.2
Belgium	10.3	Lithuania	7.7
Bulgaria	20.2	Netherlands	10.4
Cyprus	17.6	Portugal	11.0
Czech Republic	14.5	Romania	9.4
Denmark	12.5	Spain	15.5
Estonia	14.3	Sweden	7.8
Finland	14.4	Slovenia	9.1
France	8.4	Norway	11.0
Germany	10.2	Great Britain	7.6

The increasing significance of building and infrastructure management

Maintenance, supervision and management of property assets in buildings comprise over 45 percent of the jobs in the construction and real estate area in many EU countries. These jobs are not as readily submitted in official statistics as the jobs for new constructions are due to the independent efforts of individual persons or companies in handling building maintenance, supervision and building property management jobs or analogical activities in the shadow economy. Such operations probably comprise half of the jobs in the construction and real estate sector in Western Europe. This is especially true regarding construction of residential homes. In addition to maintenance and supervision and management of buildings, the management of buildings and infrastructures is becoming a strategic assignment for companies and governments more and more often.

3.2. Cyclical real estate crises

Fluctuations at a 20 percent level are verified as being usual in the sales of certain products in the construction industry. Furthermore it has been noticed that the development of the construction industry has characteristic cycles of upswings and downswings, which repeat approximately every ten years (Yisa *et al.* 1996). Construction companies that accept such cycles as an indisputable fact and a part of reality are able to prepare for a future downswing during their period of an upswing. They generally select long-term management strategies assuring an easier time of getting through a difficult period (Lovelock 1997). The Asian Crisis reflected the weaknesses in the organizational effectiveness of its industries. Since the real estate market closely relates with the financial stability of any industry, the Asian experience is expected to indicate more clearly the

needed improvements in the process of allocating real estate loans, thus helping the real estate market to recover and mature (Lu, So 2005). The combination of outmoded banking practices and an immature real estate market can partly explain the Asian crisis.

Interest margins fluctuate by about 1 percent in Western Europe whereas, in Lithuania, the interest rate on loans is over 10 percent in 2009. To put it another way, the worse it gets, the less someone wants to extend a helping hand (Chomentauskas 2009).

Whenever demand exceeds supply, a price will rise to the point of a buyer's ability to pay. An economic component of demand is the amount of money a potential buyer has. However, there are also psychological factors operating alongside this. The psychological component of demand can destine much greater fluctuations in demand than an economic component can. Furthermore there are two parts to psychological value. One is the usefulness of an object for satisfying the important needs of a buyer. XX The other part of psychological value is the expectations of the future. Expectations that it will be quite easy to acquire items important for satisfying one's needs in the future will not add any added value to purchases. However, the expectation that things will be difficult to acquire in the future will cause their psychological value to rise sharply, thereby considerably increasing the price buyers are prepared to pay. If it is possible to form such expectations among a large number of people, it is possible to generate psychological demand that supersedes economic demand. Such psychological factors strongly affect economic inflation (Legkauskas 2009). Then there are also social needs, which prompt a person to want to stand out from the rest and seek prestige. Specifically for this reason people begin needing a huge house, not simply any sort of home.

Certain branches of industry suffer during their difficult cycles by fluctuations in their production process, number of job openings and level of compensations. These include the construction, steel production and aviation industries (Seidl, Kleiner 1999).

The globalization of financial markets also affects the real estate market. Between 1985 and 1994, most countries faced real estate bubbles, recording peaks in 1989. Following this, stocks suddenly crashed, and there was a decrease in the production of goods lasting until 1994. The research conducted by Renaud (1997) is grounded on three ideas. The first regards what caused the first universal cycle to begin. The second is about the impact of such a cycle. Lastly he discusses what countries that have not fully entered the universal market for capital, such as the socialistic and developing countries and countries with transitional economies, can learn from such cycles.

Economic (or business) indicators include income and expense reports and consolidated economic indicators, which provide data on unemployment, the

numbers of residential housing units under construction, consumer price index (an indicator of inflation), industrial production, bankruptcies, gross domestic product (GDP), retail sales, markets for stocks and bonds and the like. Studies of such economic (business) indicators occurring during business cycles provide significant information for forecasting crises (Gunthner *et al.* 2007).

The first real estate market crisis in the United States hit in the state of Florid, in 1926. This state, situated on the shores of the Atlantic Ocean, had become very popular among real estate buyers from the beginning of 1920. Prices started growing by impressive leaps and bounds: in 1925 alone, the price for a house in Florida increased four times. At such rates, 99 percent of people residing in Florida were either investors or sellers of real estate. By the start of 1926, prices hit their maximal peak: no more new participants entered the market. Meanwhile the old-timers decided it was time to sell their homes. Over a matter of several months, the fallen prices reached their previous level during 1923. Other crises were systematic and affected other economic sectors. The Great Depression occurred in the United States from 1929 to 1933. The first stock market crash was on October 21, 1929 (Black Tuesday) and it hit the real estate market later on. A crisis in production surpluses appeared in all branches of industry (as well as in real estate). Real estate prices began nose diving, in March 1930. Banks were barely solvent due to unpaid debts on a massive scale. With the last money they had, banks began buying up the now cheap real estate. Consequently there was a huge bank crisis during which a fifth of the country's banks (some 6,000) bankrupted. The government of the United States managed to achieve an improvement in the real estate market in 1932 by passing a mortgage lending development program (Kuodis 2008).

Another crisis hit the United States in 1987. As usual the stock market fell first on October 19, 1987 (Black Monday). The consequences were that real estate prices fell by 40-45 percent, reaching the level they were at the end of 1960. Unexpectedly Japan helped the American real estate industry climb out of the crisis. Japanese investors spent some 75 billion USD in the country's real estate during 1985–1992. The crisis in Japan itself caused a surge of investments in American real estate in 1990: a tremendous number of loans for purchasing American real estate accumulated in bank balances. Thus real estate prices in Japan fell by nearly 50 percent in a short time. The recovery from the consequences of the crisis in Japan's market only started by the end of the year, after the Japanese Government took decisive steps in regulating banking operations.

During the latter half of 1980, the prices of real estate ownership doubled in Sweden. At the start of 1990, however, the real estate bubble burst in Sweden followed by declining financial institutions, numerous bankrupting companies and sharply rising unemployment. Stagnation paralyzed Sweden for three years. A great many new loans descended on an already overly filled real estate

market. The companies that had invested in this market were the first to experience problems. Most of them were dependent on Sweden's dominant banks. In December 1992, the largest financial institutions of the country were on the threshold of bankruptcy for the first time in sixty years. The prices of commercial buildings fell by 20–25 percent, from 1991 to 1993. Liberalization of the economy and the attraction of capital from the interior helped overcome the crisis. The Swedish Government, fearing that the banking sector would bring the economy to ruin, passed a decree regulating all bank obligations in 1992. The goal was to protect investors from losses; however, stockholders were harmed in the effort to avoid risky financial moves in the future. The government received part of the stocks in banks for rescuing the banks using taxpayers' money, at the expense of the existing owners. The sudden reaction to the problem by the government was one of the reasons for rapid improvements. Economic growth in 1994–1995 reached nearly 4 percent and, by 1996, no traces of the economic crisis were left. The warranted actions the Swedes took during the crisis were praised by economists. Sweden's experience was employed to resolve the crisis in the Asian countries in 1990 (Kuodis 2008).

The Asian crisis reached Russia on August 18 1998. In a few days, the local currency, the ruble, was devalued, and the stock market and banking sector collapsed. The real estate market held up until April 1999. The reduced purchasing power of residents caused a drop in housing prices by about 50 percent between April and August of 1999 (e.g., in 1998, the price of a one-room apartment in St. Petersburg was 22,000 USD whereas, in 1999, it was a mere 11,000 USD). The explanation for the lengthy time span from the start of the great economic crisis to the fall in real estate prices is that, at the time, bank loans were not widely employed for real estate purchases in Russia, and the participation by the real estate sector in the stock market was minimal.

The financial fiasco was a phenomenon approaching for its turn in Sweden for a considerable time. Swedish banks had not fully considered the systems for their loan provisions in 1985, and this attracted numerous new customers. Neither the banks nor the government had appropriately assessed such an upsurge; thus the banks were caught unprepared. The Swedish Government employed a large proportion of taxpayers' money for reviving their banks. Economists assert that the Government of Sweden capitalized their tax system. Sweden's lawmakers founded the Bank Support Authority, which acted as the chair for re-establishing the sector of banks, which had incurred damages. This institution was obligated to assess and regulate the movements of loans together with the government and to draw the line between the institutions that could not recover and those that could prosper again. The doomed banks were sold or integrated into stronger companies, while the healthy and strong ones were revived with funds from the government and from the private sector. The Swedish

Government, in this case, owned 22 percent of the banking system. Once the crisis ebbed, and the banks began working profitably once again, the taxpayers received their share.

Central and Eastern Europe had characteristically growing construction sectors until mid-2008, due to publically financed projects. This branch of industry comprised the greater part of GDP in these countries as compared to Western European countries: the construction sector in the Czech Republic reaches 15 percent of the country's GDP, whereas it only comprises 6.6 percent in the economy of Great Britain. Persons working in construction in the Czech Republic were getting orders for the development of a needed infrastructure as well as for public facilities, such as hospitals and court buildings. As the standard of life bettered, residents gained better opportunities to receive loans for purchasing homes. Strabag, an Austrian group, realized long ago that the Eastern countries would be growing for such reasons. A third of its annual income of 9.43 billion Euro comes from this region (Strabag 2008). The growing GDP along with personal incomes of Lithuania from 2001 to 2008 had a positive impact on investments earmarked for the infrastructure and for private construction operations (see Figure 3.1). Figures from the construction skills network shows a slow return to growth in the construction sector during 2012–2014. Government and public sector funders are being urged to take a sustained approach to public sector construction investments.

As demand for construction increased/decreased, construction prices rose/fell. This is not only noticeable in Lithuania but in other EU countries as well (see Figure 3.1). The compensations for employees in the construction sector in Lithuania changed in consideration of the relationship between demand and supply (see Figure 3.2).

In Lithuania the demand/supply ratio determined salary changes for people working in construction (see Figure 3.2). Increasing/decreasing demand for construction caused a rise/fall in construction prices. Such a situation was not only observed in Lithuania but in other EU countries as well (see Figure 3.2). The construction input price index (CIPI), shown in Figure 3.2, covers buildings and civil engineering works; it is a Laspeyres-type price index reflecting the main input price changes in new constructions over a definite time period while maintaining the weight structure of the referenced period. Indices of construction work carried out within the country, shown in Figure 3.2, covers buildings and civil engineering works; it is a price index reflecting the main input price changes in new constructions over a definite time period while maintaining the weight structure of the referenced period.

Numerous tendencies became pronounced as the real estate bubble increased globally. For example, too many and too many overly-large buildings were constructed in unsuitable locales. Additionally there was an unnatural increase in

home owners who numbered too many. The public believed that housing prices would never fall again. It may have been far more effective to invest the same money in innovative technologies, the sciences and industry rather than in real estate.

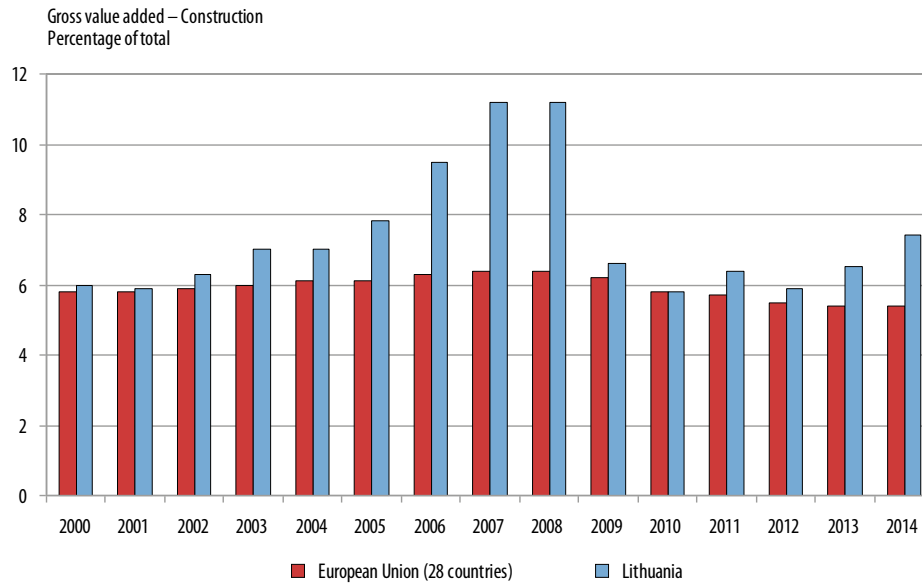


Figure 3.1. Changing share of construction in Lithuania's and EU (28 countries) Gross Domestic Product (Eurostat)

Figure 3.3 shows the changes in construction production and in construction costs for new residential buildings in EU 28, UK and Lithuania over time. The objective of the production index is to measure changes in the volume of output at close and regular intervals. The objective of the construction cost index is to show the development of costs incurred by the contractor to carry out the construction process.

The absolute majority of today's buyers purchase a home on borrowed money. A home loan is taken for a period of thirty to forty years. Every family must weight its capabilities, attempt to forecast probable future income and assess the risk of losing a job prior to taking a loan of this nature. The Consumer Confidence Indicator well illustrates buyer expectations (see Figure 3.4).

The European Commission initiated a study on opinions held by consumers. This study is conducted by interviewing 1,200 randomly selected respondents. The Consumer Confidence Indicator consists of the arithmetical average of the balance of positive and negative answers to four questions (about the financial situation of a household, the country's general economic situation, changes in the number of unemployed (with the opposite sign) and the probability of savings over the following twelve months).

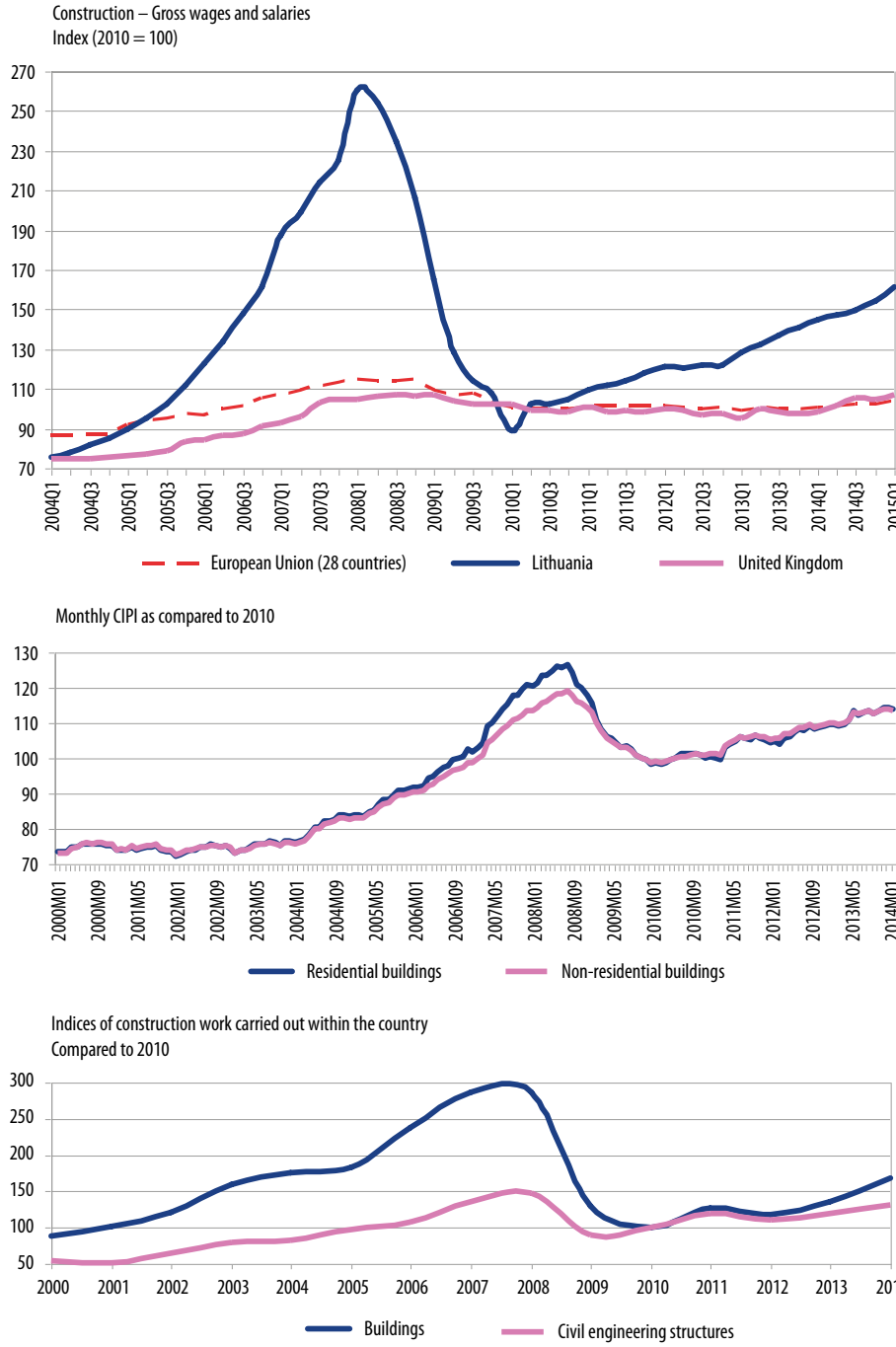


Figure 3.2 Construction gross wages and salaries (a) increase with growing amounts of construction work (b and) and fluctuation in the period of crisis and recovery (Eurostat)

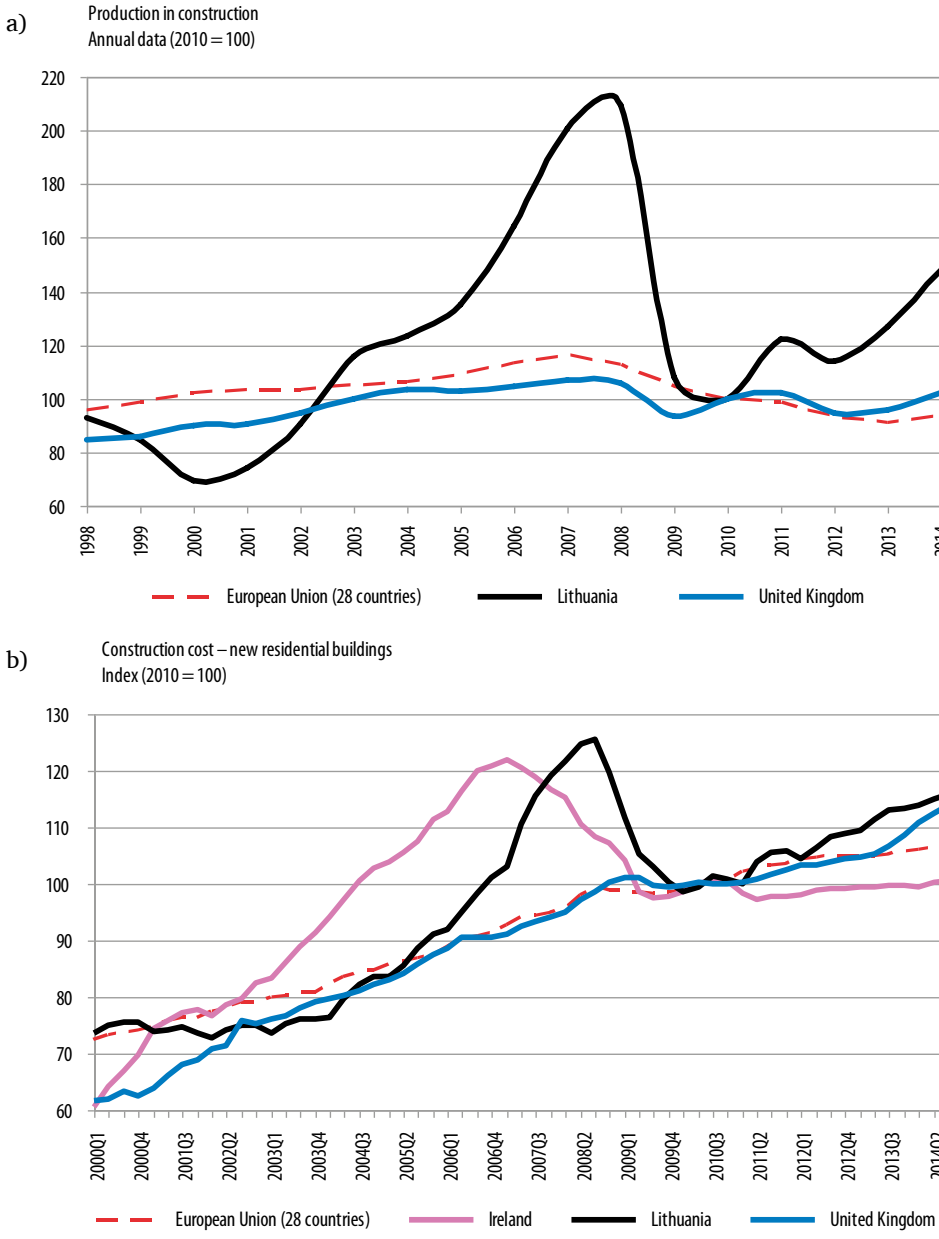


Figure 3.3. EU 28 construction production (a) and construction cost for new residential buildings (b) in Lithuania, Ireland and UK (Eurostat)

The Consumer Confidence Indicator grew for a long time throughout the European Union. Then the first of many signs that the economy is overheating appeared during the latter half of 2007, and the Consumer Confidence Indicator turned in the opposite direction.

The Housing Affordability Index of Lithuania was nearly always the lowest in comparison with Western European countries (see Figure 3.5). It was not until 2001–2004, when conditions for acquiring credit bettered and housing prices had not started climbing sharply, before the Index surpassed the 100 rated index. Housing prices began increasing in 2005, and the Affordability Index began dropping. In 2007 it reached only 63, the lowest index in all the eight countries under comparison. However, in 2008, housing prices began dropping, while income continued increasing, and the Housing Affordability Index rose. This Index was exactly 75.9 in March 2009. Despite dropping income levels and worsening loan conditions, it is likely that the Housing Affordability Index of Lithuania will continue to grow due to the dropping housing prices.

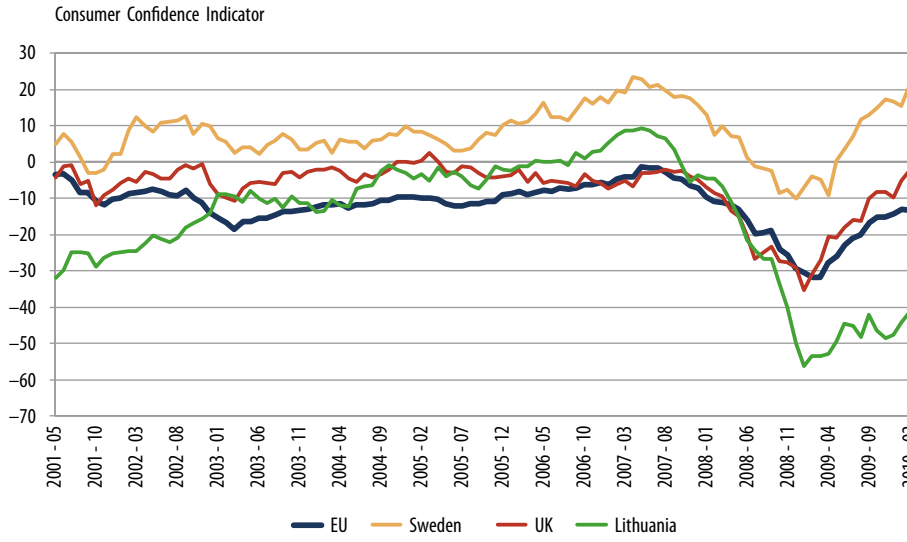


Figure 3.4. Changes in consumer confidence over time in the EU, Sweden, United Kingdom and Lithuania (EU Commission)

Failing companies and firms – they are part of our surrounding environment. They cause financial as well as other kinds of tensions in society and in the government, which can also affect the international community. Despite the attempts to forecast and recommend action plans when bankruptcy threatens, the failures of organizations spread spontaneously from one sector to another and from one country to another. Marwa and Zairi (2008) have investigated the documentation of 120 companies operating in various areas that failed during 2000–2007, searching for similarities and differences in actions taken by their managers. Of them six companies were operating in the construction branch. Their reasons for failing could be grouped and defined as follows:

- Internal: accounting mistakes, imprecise calculations, poor construction quality, internal polemics, "inflated" contracted prices, dishonesty within project management;
- Influence of the near environment (microenvironment): unsuccessful merger, sudden expansion, high accounts receivables, missing deadlines, large exploitation expenses;
- Macro-environmental impacts: decreased sales capacities, competition and financial obstacles.

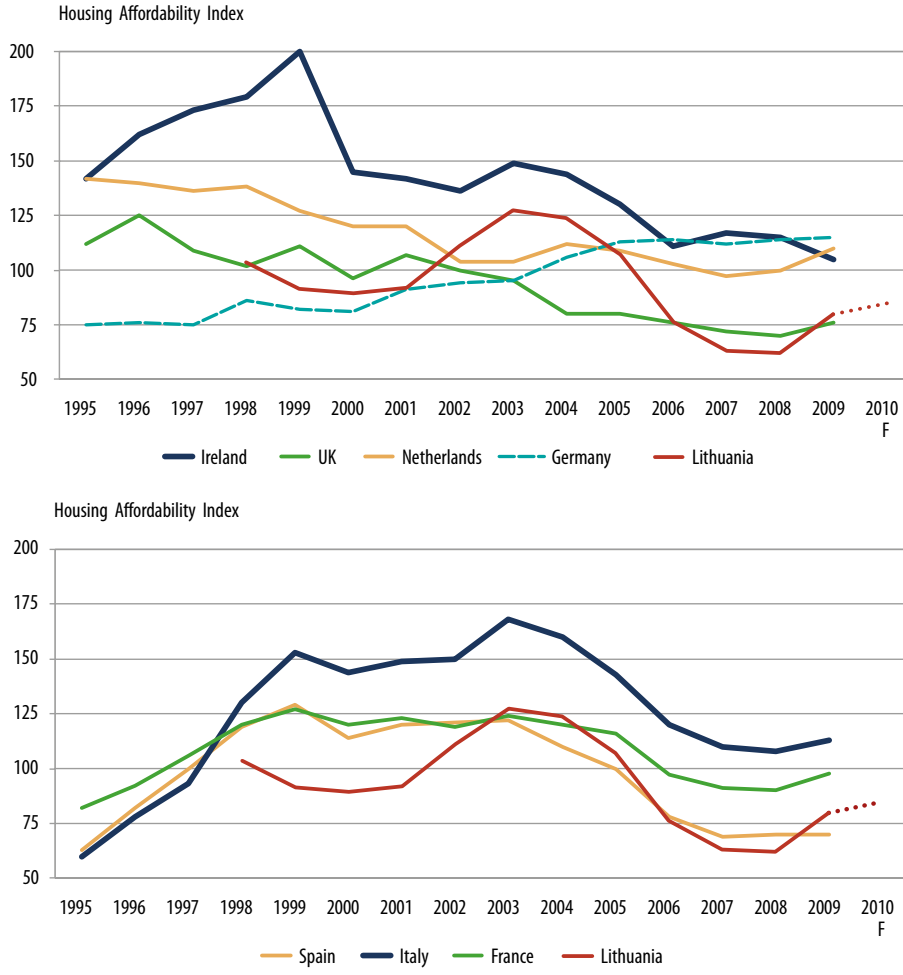


Figure 3.5. Housing Affordability Index changes over time in Ireland, UK, Netherlands, Germany, Spain, Italy France and Lithuania (UniCredit group)

3.3. Methods for managing crises in the construction and real estate sector

Various models and methods for managing crises in construction, real estate and their different segments are being applied globally at this time. These include econometrics, for example, the Keynesian model, serial analysis, performed multi-parameter regression-based, Box-Jenkins method, variable parameters model, time-series statistical model, multivariate *Logit* model and competing-risks hazard models with time-varying covariates and the dummy variable approach. Other applications include operations research, such as, for example, statistical analysis, discriminant analysis (Haslem *et al.* 1992), *logit and probit* regression models (Canbas *et al.* 2005) and artificial neural network models, like fuzzy clustering and self-organizing neural network (Alam *et al.* 2000); back-propagation neural networks model (Tam 1991); multiple criteria decision-making (Pasiouras *et al.* 2010; Niemira; Saaty 2004; Garcia *et al.* 2010); artificial intelligence, like support vector machines (Boyacioglu *et al.* 2008), *k*-nearest neighbor algorithm (Tam 1991), decision tree (Frydman *et al.* 1985) and others. Technical approaches of operations research include decision support systems (Gao, Xu 2009; Pasiouras 2010; Chen *et al.* 2010), expert systems (Lin 2009), mathematical programming (Siriopoulos, Tziogkidis 2010) and multicriteria decision methods (Pasiouras *et al.* 2010). All these methods are applied for crisis management in different areas of construction and real estate.

Econometric methods (Minsky 2008; Nishiyama 2006; Liow, Webb 2009; Aizenman, Jinjarak 2009, 2010; Gan 2004) that explain and model crises in the areas of construction and real estate are applied globally for performing numerous studies. Some of these methods are further analyzed for the purpose of providing examples.

Many experts practicing in financial markets would be inclined to agree that both positive and negative fluctuations in real estate prices depend on the fluctuating desires among investors to accept risk. The economic basis for this outlook is noticeable in the post-Keynesian economic and financial instability and behavioral models in the market for finances (Minsky 2008).

Liow and Webb (2009) studied the general factors impacting the markets for real estate stocks and bonds in the United States, United Kingdom, Hong Kong and Singapore.

Aizenman and Jinjarak (2009), who analyzed Germany's real estate markets and banking data, established the link between a current account deficit (the difference between monetary inflows and outflows) and changes in real estate prices (GDP deflators). The possibility of defaults on debts decrease due to high real estate prices. Nevertheless, a constant rise in real estate prices can encourage banks to choose high-risk creditors in their effort to extend loan packets.

That means the possibility of the bank bankrupting also increases. Fluctuations in housing prices cause instability in banking.

Gan (2004), who analyzed the real estate recession that occurred in Texas in 1980, established how the structure of the banking market interlinks with financial stability. Long-term experiences have shown that business cycles are interrelated. Such a close interrelationship means that the external shock impacts the overall economy equally as strongly as it does the construction industry itself. Both the public and the private sectors sharply decrease their construction expenses during times of crises. Since construction objects have a high value, they are postponed for better times. The dynamic sequence of modeling method is especially suitable for such a situation (Goh 2005).

Globally various methods and models are employed for forecasting, modeling and managing crises in the real estate sector and its different segments. These can be the multi series analysis using multiple regressions for neuron networks, three indicator model, variable parameter model, macroeconomic behavior package, decision tree, decision-making support, post-Keynesian models, calibrated macromodels and other such methods.

Crisis management in the real estate market is quite often analyzed through the prism of banking. Since lending by banks was and is the main engine driving real estate markets, policies for providing bank loans can have a great impact on crises management in real estate.

Further there is a review of the *econometric and operations research methods*, which are employed for describing, analyzing and foreseeing financial crises and defaults on real estate loans as well as for resolving these problems. Most methods (applied individually) do not provide opportunities for accurately foreseeing real estate and financial crises or the insolvency of financial institutions.

Statistical methods are often applied in joint with other methods for a model to provide better results when attempting to analyze and foresee insolvency and crises. In most cases, employing the operations research method separately or in joint with statistical methods assists in foreseeing a crisis better than using statistical models alone. Lately hybrid intelligent systems by which several different methods are synchronized have become popular (Demyanyk, Hasan 2010).

The *subprime* loan crisis has been deliberated empirically by applying the statistical model on duration, which permits assessing the so-named survival duration of real estate loans, i.e., how long is it expected for the loan to remain ongoing before the first transgression (a payment is missed) or insolvency occurs under the condition that no earlier transgression or insolvency had ever occurred. Additionally the model takes in consideration various characteristics of different loans and borrowers as well as macroeconomic conditions. This model shows that the crisis in the market for subprime real estate loans did not occur due to falling housing prices in the United States, as many had guessed.

The crisis had been brewing for at least six consecutive years before its signs became obvious.

The quality of subprime loans for real estate had been worsening at an even, monotonous pace annually from at least 2001; however, the rising prices for housing disguised such a course of events. In other words, the quality of loans did not worsen suddenly, just prior to the wave of financial defaults – the quality was poor and it worsened each year. The worsened quality could only be noticed once processes in the housing market began slowing – when the poor loans could no longer hide behind the huge growth in the value of housing and when the poor loans became impossible to refinance.

Additionally it is being revealed that the aforementioned phenomenon of steadily worsening subprime real estate loans was characteristic of the entire subprime loan market. All subprime real estate loans can be grouped in the following categories: having a fixed interest rate, having a fluctuating interest rate (hybridized), purchase-money, cash-out refinancing, mortgage with complete documentation and mortgage with little or no documentation.

Certain scholars (Reinhart, Rogoff 2007) who had deliberated the macro-indicators of the United State prior to the 2008 real estate and financial crisis and the crises in eighteen other industrial countries after World War II discovered amazing similarities among all of them. More specifically, it seems, what was common among the countries experiencing crises was a rather large increase in housing prices before their financial crisis began. What is even more amazing is the evidence that the rates of growth for housing in the United States were much higher than they were in the so-named Big Five countries during the times of their crisis (Spain in 1977, Norway in 1987, Finland in 1991, Sweden in 1991 and Japan in 1992). Comparing the actual rates of growth in the equity market price indexes, the authors once again determined that pre-crisis similarities were obvious in all the countries experiencing a crisis. Furthermore, when comparing budget deficits, not only are the similarities noticeable between countries; the deficit of the U.S. budget, which reached 6 percent GDP, was greater than those of the other countries just prior to their crisis. However, the authors also notice many ambiguities relative to the 2008-2009 crisis in the United States; therefore, the means for resolving a crisis is impossible to foresee on the basis of experiences in other countries.

Overview of operations research models

Several models of operations research are presented next. These are frequently applied in empirical literature for foreseeing bank insolvencies or failures and can be used for foreseeing defaults on loans or insolvencies of non-financial institutions.

The classical case of operations research regards determining the risk of insolvencies relevant to banks, loans and stocks and bonds. Numerous scholars

deliberated this issue after Altman (1968) came out with his work proposing use of the so-named Z-score to foresee the risk of company insolvencies.

The research reveals that various methods of operations research can be applied for forecasting crises and bank failures. For example, Celik and Karatepe (2007) established that artificial neural network models can be applied for forecasting the proportion of bad loans among all loans, capital proportion of assets, profits proportion of assets and equity proportion of assets. In another example, Alam *et al.* (2000) show that fuzzy clustering and self-organizing neuron networks are classification means, permitting to establish banks that could potentially fail.

Most central banks aimed early warning systems to observe risks at banks for many years. Nonetheless, the ever-repeating crises over the past two decades – Asian crisis, Russian bank crisis, Brazilian bank crisis – show that it is no easy task to safeguard the banking system. The regulatory institutions of the United States are obligated to investigate risks at the banks themselves every twelve to eighteen months, as demanded by the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991. These regulatory institutions use the CAMELS rating system, which indicates the security and reliability of a bank. CAMELS ratings consist of six parts: capital adequacy, asset quality, managerial experience, earnings reliability, liquidity and sensitivity to risk in the market.

While analyzing bank crises, Davis and Karim (2008) compare logistic regression (*Logit*) and signal extraction methods. They established that the selection of assessment models have meaning regarding the characteristics of the indicators and foreseeing crises. Davis and Karim (2008) investigated whether or not Logit could help foresee the subprime loan crisis in the United States and the United Kingdom. By taking twelve macro-economic, financial and institutional variables, they determined that this model, the same as many others, had very few chances to foresee a crisis.

For many years, discriminant analysis (DA) was the main method used among *statistical* methods for analyzing and foreseeing bank failures (Karels, Prakash 1987; Haslem *et al.* 1992).

Canbas *et al.* (2005) suggest the early warning system (EWS) as a means to help anticipate a bank failure. To test the possibilities of EWS, the authors used data from forty private commercial banks of Turkey. They concluded that the forecasting ability of EWS is better than any of the other models being applied in literature.

Multicriteria decision-making (MCDM) method is a model permitting the analysis of several criteria at one time. Doumpos and Zopounidis (2000) considered the multivariate nature of financial risk as they were establishing risk classes containing alternatives. This led them to propose application of a new

operational method – *Multi-Group Hierarchical Discrimination*, which came from MCDM. These authors applied this method using World Bank data, which divides 143 countries into four risk classes according to their economic results and credit ratings. They conclude that the results gained by this method are better than those gained by traditional multiple discriminant analysis.

The MCDM method can be used for compiling credit ratings and establishing the reliability of a bank. For example, Gaganis *et al.* (2006) apply the MCDM model as they are applying the UTADIS method for the purpose of dividing banks into three groups by their reliability. The sample consists of 894 banks from 79 countries. The model was created using the ten-fold cross-validation procedure. The results show that the assets quality, capitalization and market in which the banks operate are the most important criteria for classifying bank reliability. Profitability and effectiveness are also important factors associated with bank results. Additionally the authors established that the accuracy of the classification by UTADIS is superior to discriminate analysis (DA) and to *Logit*. Zopounidis and Doumpos (1999) also deliberate whether or not the UTADIS method could be applied for analyzing business failures. They compared this method with DA and the standard Logit and Probit statistical models.

Other models

An assumption is often made that the participants in a market have limited abilities to analyze all accessible information; therefore they apply a simple, decision-making rule (for forecasting property prices). Thereby potentially all market participants have the same information but differ in the ways they interpret and use that information. Such an outlook is called the bounded rationality model. As example, imagine there are two groups of investors operating in a market. One group has professional investors who analyze information about the fundamental factors influencing market prices. The other group can be called enthusiasts – they are more involved in extrapolating the price evolvement in the past (e.g., if housing prices rose recently, they will continue to rise). This illustrates that bubbles and market failures can easily occur in a market in which these two groups of players are operating who are applying different forecasting rules. Even when the persons operating in a market are not all that professional, it is no wonder professionals can more readily “ride bareback on the bubble”, i.e., purchase property even when they realize its market price is inflated. What is most important is to get out of the inflated market by finding a “fool” who will buy that overpriced property. The knowledgeable people in Lithuania’s real estate market often talk about certain apartments near Vilnius in a rather poor neighborhood that changed ownership about five times in a short time. Obviously those were purchased for speculative purposes (i.e., the buyers did not live in them, because the quality was poor, and they knew this when acquiring the apartment). The last one in this chain of transactions takes the role of the

fool – nobody wants to live in the apartment and, added to that, the price falls, and there is nobody to sell it to... (Kuodis 2008)

It can be emphasized that scholars from different countries who discussed the crisis in construction and real estate and their different segments did not analyze a research object such as these authors investigated: the process of the existence of the construction and real estate sector, the interested groups participating in it and the effectiveness of the branch operating in the external micro-, meso- and macro levels of the environment as a single entity. New project methods involving multicriteria analysis were developed for a complex analysis of research objects such as these.

3.4. Analysis and model of the aspects pertinent to crisis management

3.4.1. Do traditionally used construction and real estate indicators completely describe the actual situation?

The traditionally used construction indicators (excepting employees since they pay taxes and the like) do not completely describe the actual situation in construction, its effectiveness and work quality for a number of reasons. Next are examples illustrating this. Most construction indicators (data on work performed quarterly and annually by construction companies, quarterly and annual data on building constructions and so forth) are calculated after the construction production has been sold. The construction production that is neither bought nor sold is not included in a country's GDP. During a period of crisis in the construction sector, there are a great many built but unsold buildings. Furthermore the sizes of the shadow economies in construction also differ among the countries under deliberation, a matter that is very difficult to assess directly. Then, during a boom construction period, employees in construction often work overtime. For example, in Lithuania, construction workers often worked 65 hours per week. This was being assessed as an increasing indicator of effectiveness in construction. However, was it actually that? People became overtired, physically as much as emotionally; they rested less, got sick more often, the quality of life decreased sharply along with the joy of life and family relationships suffered.

The risk of coming down with depression increases by three times among women who do not take regular vacations whereas, for men who do not take regular vacations, the likelihood of dying from a heart attack increases by 31 percent. Different studies have established that the work productiveness of people who do not take vacations and work overtime is as much as a third lower than it is for others. Meanwhile those who work more than 60 hours per week are unable to soberly judge situations and make many errors, and the companies

they manage become vulnerable in competitive battles. These and other factors decrease the objectivity of the traditional construction indicators when assessing the effectiveness of construction operations (Šėmienė 2010).

Today it is no longer possible to compare the Baltic countries with the former "sisterly" twelve republics. Most of our former "sisters in fate" are wallowing in poverty today and experiencing regression. For some their situation is considerably worse than it was in the 1990s. These are considered third world countries. Turkmenistan, which is wealthy for its reserves of crude oil and gas, is dragging at the tail's end, one of the most backward of the post-Soviet countries. Over 60 percent of this country's residents live on less than 1.25 USD per day (the international poverty line), although the annual GDP per resident of the country is comparatively not all that low – 6,900 USD. The level of unemployment reaches over 30 percent in this country. The question comes up – what destined such a different level of development among all the fifteen Soviet republics? The scholars who are examining these countries more comprehensively came to the conclusion that this is due to the influences of differences in mentality, historical traditions as well as the comprehension of statehood, national identity, religion and the political regime along with the outlook on work. Furthermore the geopolitical situation of these countries plays a role as well (Janužytė 2010). Therefore it is essential to consider numerous micro-, meso- and macro-level qualitative factors when forecasting construction and real estate crises.

3.4.2. Construction and real estate crisis management model as these authors propose

The traditional analysis of a crisis in the construction and real estate sector is grounded on legal, institutional and political aspects. The opinion of Lu and So (2005), as one example, is that, although the sudden collapse of the Asian economy during the 1997 financial crisis was a topic of many studies, most of them concentrated on the primary economic principles. Furthermore scholars and practitioners alike are not convinced if the means United States President Franklin Roosevelt used to stimulate public demand, aimed for overcoming the Great Depression, were actually effective. They claim the war was what actually helped to pull out of the depression. What receives far less attention regarding crisis management are its social, cultural, ethical, psychological, religious, demographic, spiritual aspects as well as the aspects relevant to education. It is essential to analyze the life cycle of a crisis in the construction and real estate sector in a complex fashion involving a thorough system of criteria for a fully integrated discussion (see Figure 3.6).

Different countries frequently select different strategies and tactics in their efforts to lessen the impact of a crisis in construction and real estate. This is

entirely natural, because their economies and markets differ by legal, institutional, technological, technical, cultural, psychological, ethical and other aspects. Traditionally an analysis of a crisis in the construction and real estate sector is grounded on economic, legal, institutional and political aspects. Less attention is given to the social, cultural, ethical, psychological, religious, demographic and spiritual aspects as well as to aspects relevant to education.

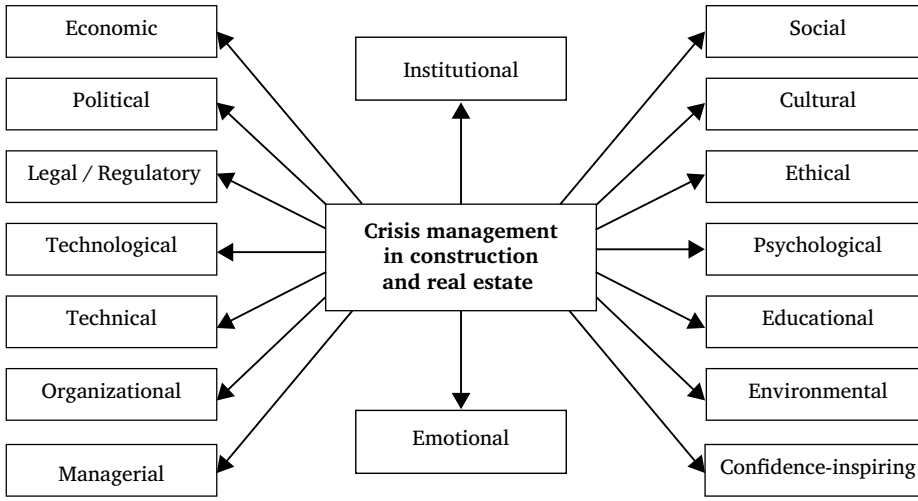


Figure 3.6. Aspects of crisis management in the construction and real estate sector

Overcoming a crisis and pursuing advancement in the area of construction and real estate cannot be assessed by economic and technological triumphs alone – true advancement also encompasses elements of values. Even a market cannot perform its functions unless activities are based on solid, mutual trustworthiness.

These authors propose modeling a crisis in the construction and real estate sector based on six stages:

Stage I. A write-up comparing crisis management in the construction and real estate sector in developed countries and in Lithuania:

- a description of the effectiveness of crisis management and the compilation of a system of criteria (using relevant literature and methods of expert assessments);
- a write-up in a conceptual and quantitative form according to the selected criteria of the existing condition of crisis management in developed countries and in Lithuania.

Stage II. A write-up comparing crisis management in the construction and real estate sector in developed countries and Lithuania (reikšmė ta pati, kaip Stage I):

– determination of the global development trends in crisis management (general, repetitive characteristics);
– determination of differences in cohesive crisis management in developed countries and in Lithuania;
– establishment of the strengths and weaknesses of these differences for Lithuania;
– determination of the most suitable practice of crisis management for Lithuania in consideration of actual conditions;
– assessment of the differences in the know-how of interested groups about the best practices globally and the practices they use.

Stage III. General recommendations formulating how to improve the level of effectiveness of interested groups operating in the branch of construction and real estate.

Stage IV. Specific recommendations submitting how to overcome a crisis offering several alternatives for each general recommendation proposed in State III.

Stage V. Performance of a multicriteria analysis on the components of crisis management in the construction and real estate sector selecting the most effective alternatives of crisis management and then interlinking the matched, rational components of crisis management derived in this stage into a comprehensive, cohesive process of crisis management.

Stage VI. Introduction of effective crisis management decisions into practice and implementation of transformational training and behavioral changes.

3.4.3. Analysis of the aspects for a model of crisis management in construction and real estate

The European construction market is not homogenous. The current situation and perspectives of each member country depend on their situation with consideration of their needs, demographic trends, fundamental principles of economics and the like. These also depend on when corrections were made to the real estate market and on the openness of a specific country's economy to the impacts of a financial and economic crisis. Finally they depend on what means will be selected for revival and how successfully they will operate in the construction sector (Detemmerman 2009).

Interrelationship of economic and qualitative factors

Experts essentially agree that, in general, inflation is an indicator of a strengthening economy. However, whenever a wave of inflation started rolling in overly much, the quality of life for people began to worsen. International Monetary Fund experts assert that the current inflation is due to the implementations made by last year's governments to prompt their economies. Whenever money is being pumped into an economy, it is bound to affect prices sooner or

later, and no one can expect anything other than that. That is why Germany, as much as France, is already making plans on how to protect the country for the future, overheated economy, which threatens after a crisis, and on how to control the threatening inflation (Janužytė 2010).

Lars P. Feld and Friedrich Schneider, investigators of the underground, shadow economy, investigated the underground economies of thirty countries belonging to the Organization for Economic Co-operation and Development. Per their assessment, the greater the difference is between the price of a legal job and the income received in hand, the greater the incentive is to work outside legal bounds. Furthermore about a fifth of the size of the shadow economy depends on the tradition of paying taxes. After all paying taxes is a certain kind of agreement, which formulates the rights and obligations of a taxpayer equally as much as of a tax collector. Thus a tax paying tradition closely relates to how taxpayers comprehend the quality of the services a government provides for the taxes they pay. There is a greater inclination to pay taxes, when it is believed that correct political decisions are being made. This aspect is especially relevant in Lithuania. It is clear that the way the government usually behaves is different than how the people of Lithuania would like it to behave. Therefore the government itself contributes to the inclination to avoid paying taxes with its inappropriate decisions. The means for fighting the shadow economy selected by most countries was deterrence, i.e., increasing fines and lessening the opportunities for avoidance. Although deterrence is emphasized in theory as much as in the practices at large for combating the shadow economy, according to F. Schneider and L. P. Feld, there is nearly no empirical evidence of it actually giving results (Žukauskas 2010).

A person who is paid a minimum wage cannot receive any welfare support. In such a case, the person is left with only a few alternatives – remain in constant poverty and never have enough to eat or emigrate. Another opportunity is to get added income from the shadow economy, such as taking on an illegal job or the like. Any sorts of discussions about overcoming the shadow economy must begin with one simple question – what will happen if that shadow suddenly ceases to exist? How many people will be unable to survive any longer? The shadow is one of the cornerstones of the existing economic system in Lithuania, which guarantees a livelihood for many people. Thus no battle with it is possible, so long as there is not even an effort to put the economy on its feet. This has to start with a discussion about the actual costs of all resources (employment being one of them) and about why employment in Lithuania is systematically evaluated as lower than its level of regeneration (or, to put it in plain language, why so many people do not earn the income they need to be able to survive honestly) (Maldeikienė 2010).

Probably the only continent in the world with any countries, even if it is merely a few (Luxemburg, Estonia), that do not live from debt is Europe. The

countries with small debts, which could never be considered a burden, are the Czech Republic, Slovakia and Slovenia. In the opinions of Standard & Poor's analysts, minimal debt is a very important safeguard and guarantee that these economies will be resilient to any sorts of crises (Janužytė 2010).

The origins of investments into Lithuania have an influence on the country's policies, business ethics, the level of technological innovations and perspectives for the country's development. As one example, the government of Spain has been consistently and actively fighting the investments of underground Russian capital into its real estate. Nearly three billion Euros have already been confiscated. Spaniards believe that such investments into real estate bring more damages than benefits.

Rapid GDP growth has quite many advantages, such as a high return on investments that attracts much foreign capital, improving technologies, lower unemployment, increasing numbers of educated and qualified specialists and funds, which appear for investments in education, the arts and the infrastructure. Another advantage is a quickened speed of reforms. However, rapid GDP growth also carries dangers, such as a market that doesn't have time to adjust to increasing investor needs, an overheating economy, appearance of more and more high risk bank loans, a society that loses its vigilance about savings, possible increase in the level of corruption nationally, an increasing inflation that can prompt the appearance of bubbles and unfounded expectations (Janužytė 2010).

Different interested groups (European Commission, international rating agencies, financial institutions) sensitively react to many, macro-level actions taken by the Lithuanian Government. For example, they react negatively to tax decreases.

There are also positive aspects to crises. All Lithuanian governments fought unsuccessfully with the deficit in the national, current balance of accounts for over ten years (imports exceeded exports considerably). Once the crisis began, this problem was resolved in and of itself – with no administrative interference.

Psychological factors

The appearance of a crisis causes the appearance of social and psychological tensions in the society, as well as in a collective of people at some specific company. It is caused by a lack of information, insecurity and social guarantees as well as a fear of future difficulties. The management of a company needs to assure the social safety of its employees. When a company prepares its business plan, it must foresee funds for compensations along with possibilities to provide requalification for its employees.

The way participants in the real estate market behave during a crisis depends on various psychological factors. According to Simson (2008), emotional tension almost always follows financial problems and it can make a more complicated impact psychologically. There are considerations that rapid price increases occur not only for economic but also for psychological reasons. There are buyers

who keep on furiously searching for housing. Then there are interested groups who artificially keep the tensions going. Distorted information is often submitted within the market. What worsens the overall situation is the slow pace at which decisions are made that could ease matters in the construction and real estate sector. For example, procrastination was at fault when it came to improving the law on territorial planning, the procedures for preparing detailed plans and changing land designations and the conditions for cooperating on public capital partnerships. Legal acts help to rationalize human behavior and the operations of organizations participating in developmental processes by considering the existing economic and political situation. However, the psychological effects laws can have on people and organizational operations also need to be taken into consideration. Eurobarometer studies show that, as a crisis deepens, most of Lithuania's residents view the future despondently. They lessen the scope of their consumption, which deepens the crisis even more. In the past, something called "Napoleon's welfare" was employed to lessen psychological tension in the society. This was when the jobless would dig ditches and then later fill them in again, just so they would have work and pay coming in. Currently such means usually involve cleaning up a city's surroundings. There could be more creativity in this area. It might also be possible to perform some simple maintenance of staircases, hermetic sealing and the like.

Probably the greatest economic mistake regarding loans is that, over the long term, the economics of loans erases the line between work and business, and this begins to change ordinary people into businesspeople. Businesspeople accept risk because they have special knowledge about economics, management, finance and other areas, which give them the ability to manage risk. The ordinary investor who has no special knowledge about the economics of loans can do nothing more than simply participate in a pyramid. A pyramid begins to form from the moment an investor invests simply because others are investing in some area and realizing earnings from it. Such a pyramid is exclusively a psychological phenomenon. The more people who are so engaged and are making money, the more other people will enter into the same activity. The ending is always the same: the first who was able to get into a pyramid and get out on time enjoys good earnings from it, but the majority of investors lose money. A pyramid is a psychological not a criminal phenomenon (Legkauskas 2009).

As soon as the quotes on stocks and bonds began to fall, very shortly everyone could see how people's fears began rolling like waves across the world. The Consumer Confidence Index of the European Union dropped by 17 points from April 2008 to January 2009. Meanwhile, amongst Lithuanians, it dropped as many as 44 points. The behavior of the dropping confidence rate operated on the principle of the closed circle, causing lower consumption, leading to an even greater crisis, and so on and so forth (Chomentauskas 2009).

As time went on, economists also showed many anomalies in financial markets, which do not correspond with a paradigm of rational expectations. Therefore the school of alternative thought began to take an interest in the sources of irrational bubbles, i.e., the more psychological factors, such as those involving herd-like behavior, unexpected changes in investor confidence, speculative enthusiasm, fashion, group pressure, short memories of investors and the like. There was even a new discipline developed – behaviorist finances, which analyzes the anomalies in investor behaviors in financial markets and how they can cause bubbles as well as market collapses. According to this school, the instability of financial markets, bubbles and collapses cannot be explained by changes in profits, dividends or gauges of property assessments – heed must be paid more to the aspects of psychological behavior. This school, which connects economics, psychology and sociology, has greatly improved our understanding about what occurs in financial markets (Kuodis 2008).

Psychological tension can be lessened by simply talking with employees about the existing situation and consulting about possible means of resolution. For example, the head of one team of 75 employees autocratically decided how much to cut the pay for which employees. Furthermore he forbade discussing the issue. The result was a savings of a mere 10 percent of the compensations fund plus tremendous, silent discontent amongst the employees. The management at another company of 150 employees suggested to everyone to consider whether it would be better to terminate some employees or to cut the pay of everyone while shortening the work week but saving jobs. Most chose the second alternative. The result was a savings of the compensations fund reaching 20 percent and retention of the psychological climate of the team.

Scholars forecast that the increasing unemployment will prompt a breakout of mental illnesses and suicides. Oxford University scholars are convinced the economic crisis in Europe alone could demand thousands of human lives. British experts claim we must most fear heart attacks and suicides – the mental problems people have regarding their jobs or loss of income will prompt these misfortunes, the same as had happened during earlier crises. The scientists who were forecasting how many lives the global economic crisis would cost compared the mortality reasons with the percentage unemployed in Europe from 1970 to 2007. The results show that an increase in unemployment by 1 percent raises the risk of suicide among persons younger than 65 years of age by some 0.8 percent in the European Union. The scope of this number would be up to 550 more suicides than occurred previously. These authors only analyzed the results of the crises impacting mortality during the time of their research. However, they did not discuss the effect of difficult times on illnesses or the quality of life (Janužytė 2009). Human mortality greatly relates to economic crises – the mortality of residents had stably decreased from the time of the declaration of

independence to 2000 and then took an upwards leap again following the Russian crisis.

Religion

Mistrust of other participants in a market grew in business relationships due to the overall economic crisis. A year ago, it was enough for the head of a construction company to make a verbal agreement with a client regarding the capacity of a job, and the documentation for the work would be underway and the materials ordered. Now the participants to a transaction do not make a move until after the contract is signed, even when the parties are well acquainted. Similar relationships are noticeable in the public and the private sectors and in public life. The tendency for a demise of morality is a cause of concern, because the crisis will end, whereas the spiritual decline will have long-term consequences. It was no random event that the Encyclical Letter by the Pope, *Spe Salvi* [*Saved in Hope*] came out as soon as the first signs of a global economic crisis appeared. This document encourages people not to lose hope, not even during the most difficult situations in life. The third Encyclical by Benedict XVI, *Caritas in Veritate* [*Love in Truth*] is designated for social and economic issues. It is not merely an internal matter of the Church; it is meant for the society at large, including business companies and executors of complex economic and political processes. The expectation is that, as people scrabble their way out of the difficult period, they will comprehend the idea inherent in the title of the encyclical. Love without truth sinks into sentimentality. Meanwhile truth without love seems too cruel. When well-being is being developed, it must encompass the entire person including his/her personal dignity and the spheres of culture, spirituality and religion; it must not merely be limited to satisfaction of a person's physical needs. By selecting the title, *Love in Truth*, for his Encyclical, the Pope yearns to have manifestations of respect and love also be obvious in economic relationships, which are at the point of losing its humane nature. Even a market cannot fulfill its functions without operations grounded on solidarity and mutual trust. Progress cannot be judged simply by economic, technological prizes. True progress embraces elements of values as well – love and truth (Jurevičius 2009).

Unemployment

There has been a certain average level of unemployment established that indicates there is no reason for distress. This level usually reaches 6–8 percent, representing the most ideal situation in the job market. If the level of unemployment decreases or increases considerably, it indicates a sign of an imbalance in the job market. The natural level of unemployment is approximately 3.5 percent – it has been proven that, in any society, this number reflects freeloaders, who won't accept a job offer and prefer to be unemployed while receiving some certain state support. Then there is "healthy" unemployment, when another 3 percent is added to the aforementioned 3.5 percent. Anything lower

or higher than this limit indicates a sad trend. For example, when the rate of unemployment is very low – when it is less than 4 percent – it is an employee market. The employee dictates conditions, whereas employers cannot select a suitable employee and are forced to raise wages for no good reason. Then ordinary supervisors begin driving Mercedes automobiles, and the situation is not favorable to the market. Conversely, when unemployment oversteps the 8–9 percent boundary, it becomes an employer market. Now employers dictate the demands, whereas employees must agree with even the worst situations if they want to work. An unhealthy competition between employees begins (Andrejauskas 2010).

D. Mortensen, the 2010 Nobel Prize winner in economics, emphasizes that the correlation between an average salary and unemployment welfare also determines the scope of unemployment. When salaries are high in comparison to unemployment welfare, the level of unemployment is generally inclined to decrease. When the difference is not large, unemployment increases. In this case, a person out of work is less motivated to find work, a situation that is also known in Lithuania's experience, because he/she can get a welfare payment that does not differ much from a salary (Janužytė 2010).

Western European countries are now also added to the Eastern and Central European countries with increasing unemployment. As of September 2008, thousands of Western European organizations terminated millions of employees. Their immigrants who were left without means to retain their standard of life began returning home, thereby contributing all the more to the huge unemployment in Eastern and Central Europe.

A contemporary concept of public works is disseminating more and more widely in the world. It entails employees performing public works as per their own work qualification. Lithuania is no exception. This year the Law on Employment Support was passed, which gives meaning to this sort of a concept of public works.

Traditions

The greatest difference between the economies of Canada and the United States is the burden of debt, as much for their residents as for their governments. Even though the same model of a free economy operates in both countries, the Canadians did not succumb to a massive boom of incurring debt. They remained true to their tradition to rent more often than to buy. This differed from Americans who wanted to live beyond their means and necessarily in their own house. It mattered not that their home belonged to the bank, one that is now being sold at an auction. That is why today 49 percent of Americans are in debt to banks. They have either already lost the home they never finished paying for or they are barely able to bear the burden of their debt. Meanwhile 29 percent of Canadians are debtors and, of them, only about half borrowed to buy real

estate. Therefore, under such circumstances, Americans do not have any opportunities to begin consuming more and spending, whereas it is the opposite for Canadians – every month this year, they are spending more and more money. As soon as demand appears, supply pulls together as well. With that unemployment decreases, and tax collections increase (Janužytė 2010).

Security

Lithuanians are beginning to value a steady job rather than a well paid job more and more. Security and the quality of life now have more influence than material well being does. Many Lithuanian men believe they are responsible for the material standing of their family. The head of a family who holds fast to this sort of image of what a real man is knows nothing else except the responsibility to earn as much money as possible. At the same time, such men delve into work and forget that responsibility is more than a material burden but also the provision of spiritual comfort and security for the people close to them. Furthermore it is questionable whether a man can provide security for others, when he lacks security himself. When it is claimed that a man must support the family, how can there be actual security? A man is often the person who is constantly tired and angry. It is best when men are not forced to become wrathful warriors, only not on a battlefield but with their families or within society. This might result in fewer pseudo-iron men who make their relatives miserable and eventually find themselves in bearing a position of disability (Milašiūnas 2010).

Culture

Numerous organizational cultures exist, which are suitable for their specific branches of production, along with humane spheres of activities. Four types of cultures at business organizations are presented here. Two main factors have a great, indirect influence on the culture of an organization. One factor is risk (how many decisions of one kind or another are objectively risky, and how many only seem that way subjectively). The other is feedback (how quickly it becomes clear whether a decision was correct or erroneous). The four types of organizational cultures are designated according to the aforementioned two criteria: trading, beneficial transactions (speculative), administrative and investment cultures. The investment culture is characteristic of companies and organizations operating in the construction business. Construction companies are oriented towards the future. Despite huge risk, construction companies invest a great deal of money into projects about which there is no information from the market for a long time regarding the potential success or failure of implementation (Pruskus 2002).

The organizational culture of a company affects its effectiveness during a crisis. Acoording to Montana ir Charnov (2008), the values of an organizational culture impact the standards of corporate ethics and the behavior of a company's

managers. Employees newly arriving at an organization can affect its organizational culture. For example, a new project manager with specific know-how and behavioral characteristics needed for resolving problems during a crisis arrives on the job. Such a manager can affect the culture of the entire organization.

A search on the Internet saves time for a consumer searching for housing or a loan. The consumer who relies on other than Internet means undeniably spends considerably more time. The real estate buyers who search the Internet can review many more potential objects than the buyer who uses the usual services of an agent. Furthermore the prevailing information technologies should affect the standard commission rate of 6% applied in developed countries. This rate of commission relates more to culture and traditions rather than being grounded on market logic. Agents provide valuable services, and many buyers and sellers always give priority to the agent offering a full-service package. Nonetheless, the clients, not the agents, must decide which services to purchase.

Any company that decides to invest in another country must assess socio-cultural differences and avoid the mistakes similar to the ones made by the Rover Company in Bulgaria in 1990. The company's managers did not pay sufficient attention about the deep impressions remaining in the consciousnesses of Bulgaria's society and managers, which remained from the decades of Communist ideology (Elenkov, Fileva 2006).

Education

D. Mortensen, the 2010 Nobel Prize winner in economics, introduced a theory about the influence of occupational diversity on unemployment, especially during difficult times. His calculations proved that the more specialists from various fields are in the market, the more jobs appear on the supply side, once a difficult period has passed. Meantime, when the numbers of unemployed from very many different vocations increase on the job market, the chances of being hired decrease, because it is more likely that specific qualifications will not be suitable for the few open jobs available. Thereby again the likelihood increases that the many jobless on the market will not be able to fill the open positions for jobs. *Financial Times* analysts provide another example. Let's say that, during the times of a rising economy, very many people find work in the construction sector (which did happen in Lithuania among other areas). Once the crisis hits, they lose their jobs but they are unable to find new ones, because nobody needs construction workers. Meanwhile these people have no other skills or experience since, during the good times, they acquired (if, indeed, they acquired any new skills at all) a narrow vocation in construction rather than a broader profession, such as engineering. Then they would be able to seek different jobs during a downsizing period. A job search is sufficiently complicated, and people do not know the needs of the job market. Thus they invest in gaining specific rather than general knowledge, which later interferes in their finding any sort of

work. The recommendation was to decrease the number of available vocations (Janužytė 2010).

Ethics

A discussion on economic or financial ethics does not necessarily have to be about breaking the law. The collapse of Wall Street did not necessarily associate with the heads of certain companies being officially charged and brought to trial for criminal misdeeds. Ethics are more related to the quality of resolutions and decision-making. Obviously there was a great lack of ethical behavior regarding the current economic crisis (Longstaff 2008). In this context, ethical issues gain much greater meaningfulness; for example, how ethics or theories could help markets to work more efficiently, honestly and ultimately, more securely.

As a crisis deepens, the construction and real estate business becomes less moral. One example is a purposeful bankruptcy. Certain players in construction publically announce that they are experiencing great difficulties due to the crisis thus they are unable to pay their bills to banks, subcontractors and suppliers. Meanwhile, at the same time, they transfer the greater amounts of their funds on hand to a newly established company. This is not only a problem in Lithuania. All of Europe is struggling to overcome this so-called Phoenix Syndrome (Phoenix syndrome 2009).

What is the importance of ethics compared to matters such as planning and organizing in the construction business, financial analysis and many others functional areas? First of all, ethical mistakes can destroy a career much more quickly and radically than legal or accounting errors can. A bad image is one of the most dangerous factors in business. Worst of all, a negative image can directly affect a company's profits, sales capacities, the morale of the personnel, the company's management and other related factors. A rather interesting view on this issue has taken hold in the United States: has the person who breached the law also breached ethical standards? (The United States has the Anglo-Saxon legal system of precedents, whereby the courts create a law conditionally restricted by norms issued by the legislature.) It is believed that a person who upholds the law is not necessarily sensitive and moral. The opposite can be true as well; simply because something is prohibited by law does not mean a person cannot commit that same act from a moral perspective. An endless number of business transactions fall apart, because people do not keep their word (i.e., the morality principle), even when it is not legally recorded, but not because the laws are not being upheld (Paulavičiūtė 2004).

Expectations

Very serious academic economists consistently defend the viewpoint that using the means of monetary policies cannot do much to combat bubbles. If the predominate expectations in the market are that some certain property will

sharply increase in price, even an official, significant increase in interest rates might not affect the bubble. However, such an effort could negatively affect some sector in the economy irrelevant to the bubble. Financial markets are inclined towards bubbles, all on their own accord (Kuodis 2008).

The expectations and attitudes of residents have quite an effect in bringing a crisis under control. Residents are indirectly encouraged to save for a "rainy day", when the mass media pays undue attention to the horrors of a crisis. The result is paradoxical – consumption drops, and the crisis rages all the more. Thus lately a noticeable tendency is business leaders from the largest developed countries in the world displaying exaggerated optimism. A crisis can become like an illness infected by one's own self. The powers of healing have been known for a long time. For example, if a serious physician tells a patient with a serious face that the patient is about to receive a shot of very strong medication, which should help the patient heal. A good many patients actually do get well, even when they receive nothing more than an injection of water in their vein.

Social crisis

Fifteen universities operating in Michigan State were under threat of bankruptcy. Meanwhile the state was unable to assist them in any way. If that was not enough, in California, Governor Arnold Schwarzenegger claimed no more financing would be designated for any schools. That would make it the first time in the state's history, when elementary schools would have to find their own means of support. These sorts of drastic steps taken by the states prompted discussions about this crisis being social, not only economic (Janužytė 2010).

Politics and administration

Lately there has been more and more talk about shadowy aspects to a country: shadow economy, shadow governments and the like. Many politicians in the world have recently been mentioning that large corporations and banks in the smaller countries are taking on the role of governments more and more often. Lately this has been noticed in the banking sector. That is the reason Germany and France are attempting to regulate the banking sector. Large corporations also finance the primary political parties. Meanwhile, when the parties get into government, they try to pass laws favorable to their sponsors.

There is a perfect opportunity to shake off the overly-prospering bureaucratic apparatus and to answer some questions. What do we actually want from the government? What do we allow it to do? What rights has the government unnoticeably "privatized"? Perhaps it is best to shake off surplus governmental functions – then there will no longer be a need to worry about an unbalanced national budget. Why, everywhere a person takes a step – regulations, certificates, permits. You need them even if you want to chop down a tree in your own yard; one you once planted yourself… (Chomentauskas 2009)

Mathematical methods

Various economic methods are applied in Lithuania in the effort to be better at collecting taxes. For example, the tax office forecasts the future payments taxpayers will make on the basis of last year's payments made by companies. An analysis is performed every month, and special attention is paid to the largest companies. If the forecast amount does not flow in, there are attempts to explain what happened. Transactions made between companies are also analyzed to assure these are not meant merely to lower profits and thereby, the amount of taxes payable. Exporters who are new to the market are analyzed, because export goods are levied zero VAT (value added taxes). However, sometimes these goods are sold in open air markets or other outlets where no cash register is used.

Constant adaptation to changing conditions

Only one third of the 500 successful companies listed in 1970 appeared in an analogical list in 1983. This shows that those companies were unable to adapt to changing conditions. Irresoluteness and faltering hither and yon cause the demise of an organization. Of the organizations threatened with extinction, 66 percent of companies that were changing and learning were still surviving after a decade, similarly to the way activity increases a person's longevity (Montuori 2000).

3.5. Ethical religious motivation and economic effectiveness. Morality, culture and crisis

During various historical periods, religious groups that attempted to affect the economic attitudes and behaviors of their followers would face two dilemmas. For one they were inclined to consider a lack of wealth as a virtue. For example, the Bible states, "Blessed are the poor for they shall inherit the earth." The Buddhists exalt the beggar monk who travels lightly without associating himself with economic concerns, so he can delve more easily into a life of contemplation (Norkus 1997). In Ancient Greece, work was considered the difficult burden fated by the Gods. In Ancient Babylon, the belief was that the Gods created people to serve them as slaves and to work in their stead. Thomas Aquinas claimed that only necessity forced people to work. Therefore the upper classes of society avoided work and considered it shameful (Čižas 2005).

Once Protestantism appeared in Europe, doubts arose regarding the idea that the rich have questionable morality in a certain sense or the idea that the community must share its wealth and dole it out to the poor. A new idea, which was Protestant by nature, was raised regarding the good qualities there must be in regard to commercialism, materialism and individual activities. Two competitive philosophies on the economy appeared under the auspices of Christianity, which

were especially significant for the evolvement of the country, society and nation. Two contradictory histories of wealth – Protestantism and Catholicism – have shown that a country's economy (degree of success, where invested and what was engaged in) discloses more about that country's culture than many would suppose. Is religion related to the economy in the same way as a great proportion of culture and identity are related to religion? Which religion enjoys the best economic results? Why did all the seventeenth century Catholic countries fall behind financially? Why has a conditional decline been noticed in Protestant countries in the latter half of the twentieth century? How can the endless conditional poverty in Moslem countries be explained? These are fundamental questions but they are rarely discussed in articles about business or finances in the press (McWilliams 2005).

Probably the greatest contribution to the discussion about the influence of religion on the economy comes from the study by Max Weber, *The Protestant Ethic and the Spirit of Capitalism* (1905). According to Weber, the different elements of Western life – scholarly disciplines (philosophy, theology, astronomy, geometry, physics, natural sciences, chemistry, historiography, law), the arts (music, architecture), education, official administrative organizations, political systems, regime of the national government and such – differed from what had existed in one form or another in the non-Western civilizations: India, China, Babylon, Egypt, Ancient Greece and Rome. It was only in the West that different areas of life were derived from and grounded on concepts of rationality. The same can be said about the field of economics, or more accurately, one of the most significant ruling powers in the world – capitalism. Although profitability, property and monetary advantages had existed throughout the world at all times, Weber linked the concept of "true" capitalism with rationality (Norkus 1997).

How is it possible to explain historically, Weber asks, the differences in views about morality in economic life? In fourteenth and fifteenth century Florence, which was the center of the evolvement of capitalism and the market for money and capital for all the greatest political powers in the world during those times, making profits was a morally questionable or barely tolerable matter. Meanwhile, in the provincial, petty *bourgeoisie* Pennsylvania of the eighteenth century, profitability was not only morally laudable but actually an obligatory manner of life. In the nearby colonies comprising the Southern states of the United States, the spirit of capitalism was poorly developed, even though it was the big capital lists who created these colonies for business purposes. Meanwhile the New England colonies were created for religious purposes by the preachers and school graduates in joint with the petty *bourgeoisie*, craftspeople and farmers (Čižas 2005).

Weber explains that the situation begins radically changing in Protestant countries, like England, the Netherlands or Germany, with the advent of

Calvinism and Lutheranism – work and the pursuit of profits is no longer considered shameful or less valuable than spiritual activities are. Weber wrote that God had clearly manifested his will and that only activity, not freeloading and pleasure-seeking add to His glorification (Weber 1905). If, from the perspective of Calvinism, Weber explains, God's chosen had the ability to earn from their work, then they are obligated to do so, and everybody who receives such a benefit is worthy of total ethical approval. Understandably such an accent on a vocation not only promoted an ascetic work ethic but also the reliability and honesty of working people – thus a new style of life formed, and there was a reassessment of social, economic values (Širvys 2008).

An attempt to explain the link between the economy and religion best starts from Galileo. He was not a saint and he liked to engage in pleasures; however, once he started his experimental study, he had the sharpest mind of his contemporaries and the ability to discuss and argue beautifully without paying heed to others. The Vatican condemned him to death as a heretic in 1663. Galileo expressed his view of the Vatican's accusations, "The opinion that the sun is at the center of the world and that it does not move is absurd. Philosophically it is erroneous and formally heretical because it clearly contradicts the Bible." The main mistake Galileo made was not his conflict with the Vatican but the manner he chose. His fateful error was publishing his heretical views in the Italian, not the Latin, language. By one stroke of the pen, he not only differentiated his views from those of the Church but he also disseminated them publically. The greatest sin was not the heretic opinion but making it popular because it was able to greatly harm the pope's reputation. Eventually Galileo retracted his opinion but, nonetheless, at the very end he still stated, "*Eppure, si mouve* (It whirls nonetheless)." The defamation of Galileo prompted a mass northward migration of scientists, especially astronomers and mathematicians – if not physically then at least spiritually. One French priest wrote about the paradigm of Galileo while he was visiting Amsterdam in 1670, "They are all here because of it." From then on, the card was tossed. The Protestant countries essentially accepted scientific discoveries, permitted runaways to engage with their like-minded fellows, encouraged trade and discourse and, most importantly, fostered individuality (McWilliams 2005).

Work according to one's vocation is the best discipline, according to Weber. Work is not only the perfect preventative means from a shameful, immoral life but also the best means to glorify God. Time becomes endlessly valuable. A person must avoid empty chatting, unproductive entertainment and more than a necessary amount of sleep, so more time is left for work (Norkus 1997).

Thereby one could bravely accept Newton's physics and still be a good sectarian. What permitted innovativeness to flourish was such disrespect, indifference

and tolerance (not encouragement) of research. Innovativeness allowed Protestant merchants to become wealthy, and this is what permeated the entire society. One French noble concluded, "The English are wealthy because they manufacture things for the common people, not for the rich." Trade grew throughout the Protestant world. The dogmas of thirty-nine Anglican churches defended commerce and trade as well as the pursuit of wealth and provided profit and loss accounting a solid theological foundation. Meanwhile the Catholic world headed in a different direction. The Church was beset with the desire to control and a fear of scientific research. Furthermore it was allied with the nobility. All this meant that wealth continued to depend on land ownership (rather than trade). The stronger the central government is, the greater is the likelihood that merchants will seek innovations. The likelihood is also greater that a corrupt, licensed trade will form along with a well-established client system (McWilliams 2005).

The traditional and historically substantiated principles of Protestantism are industriousness, honesty, thrift and others, which could serve as good examples to follow by which it would be possible to create more humane interrelationships and achieve stable economic growth over the long term. The Reformation reestablished the Biblical understanding of work. Luther and Calvin were the first to use the concept of a person's vocation for daily work. They substantiated that God could also be worshiped by working. They and their followers showed by word and by deed that work, which once carried a stigma of shame, was grounded on God's Commandments. The Reformation formed an outlook on worldly work as a vocation or a suitable service for God. Meanwhile it made profitability an ethical standard, a moral and actually a matter to pursue. Up until then, it has been considered something that displeased God or, in the best instance, a tolerable activity. In other words, making a profit was freed from the clutches of morality. Nonetheless, this greatly raised the limits of moral demands (Čižas 2005).

The history of the economy in the United States is probably the most distinct example there is. Obviously tremendous differences existed from those times when the first Spaniards and first Puritans arrived in South and North America. In 1600 Mexico, which was Catholic Spanish, was ten times wealthier than Massachusetts was. By 1800 it was doubly poorer and, by 1900, it lagged behind even more. The difference in economic results can be explained by the differing cultural and religious outlooks on trade, innovations, research and finance. The new Protestant settlers at first had a poorer foundation and a harsher environment. However, over the long term, they surpassed the conquistadores of Mexico, Texas and California with their ideas and their trade (McWilliams 2005).

The opponents of Weber criticized his scholarship during discussions and raised various alternative concepts.

The first question that comes up – is an ethical, religious motivation truly a determining factor of economic activity? Other scholars have distinguished other factors, which they consider more acceptable, such as the yearning to enjoy life, concern for one's family, the necessity to work for the common good or the well-being of one's nation. It is also believed that the initial social situation for the Protestants prompted their involvement in capitalistic speculations. At first Protestants were a religious minority nearly everywhere, except in Geneva. In certain countries and communities, they were removed from governmental positions and professions like medicine or law. Where else could they direct their activities if not to business companies? This situation becomes similar to that of the Jews in the Middle Ages, when they took over positions in loaning and dispensing money, because the Christians did not want to "dirty their hands" with such activities or to breach Church laws against profit-making (Norkus 1997).

In the 1930s, Weber wrote about the work ethics of Protestantism. Although, at the time, it had much in common with history, time essentially showed that this forecasting model raised numerous questions. This occurred due to the history of the European and Asian economies after 1945. This was when the influence of Protestant economic hegemony had begun weakening, as the wealth of European Catholics grew – mostly France, Italy and the Catholic areas of Southwestern Germany in 1945–1985. The most powerful, traditionally Protestant countries such as, for example, the Netherlands and especially Great Britain were doing poorly. What cracked Weber's theories in the global context were Confucian capitalism, which appeared in Southeastern Asia during the 1980s-1990s, and the long-term domination of Japan in trading. Perhaps what is most important in such a theocratic dilemma is that the Catholic countries, which had gained livelier economies, had become more Protestant-like in the traditional trading sense. They were developing more rapidly as they opened up to new ideas, trade and immigration (McWilliams 2005).

During the rise of economic development, people began judging their role in the economy differently. The idea formed that one could expect to earn a great deal of money by investing. This transformation not only influenced opinions about specific investment strategies, it changed the mechanism for self-respect upon which our ego rests. Protestant work ethics, which formed the basis of the nationalistic spirit for many years, changed its face. Essentially those who worked a great deal were no longer admirable to us. Only those who knew how to cleverly invest received such respect. It is specifically this change in concept, which is the fundamental reason for the bubble. Meanwhile, once the bubble bursts, it takes the longest to unravel this concept. George Akerlof and Rachel Kranton convincingly showed economics theoreticians what they must grasp – in principle people are much more concerned with who they are and how they are judged than with what they eat or what car they drive. The chosen path of an

investor becomes not only a means to reach a goal but it becomes a goal in and of itself. Additionally, since the 1990s, the opinion taking greater and greater hold is that the powerful of the world are also clever investors (Shiller 2008). Thus, when people want to be more respected and recognized along with all the consequences coming with that, they try to become successful investors and businesspeople, even though they may lack knowledge, abilities and even the funds to do that.

However, mistakes were made in the sectors of economics and politics. Apparently there was no appropriate context of meaningfulness and leadership in the sphere of morality (culture). Society was not provided with an accurate description of human nature and destiny, which might have guided different individuals and companies in reaching wise economic decisions. Rather straightforwardly, erroneous values, an erroneous understanding of virtues, mistaken moral habits and expectations, rules and mistaken treatment of human nature and, besides all that, connecting all those with erroneous assessments of morality and experience, then applying that as a basis – that was what laid the groundwork for the greatest economic crisis and disorder since the times of the Great Depression and of World War II. The pursuit of consumption, entertainment, pleasures and luxuries has completely overtaken the Western world these days, and all this is rapidly spreading and manifesting in an especially individualistic way. Such individualistic consumption has now encompassed the sphere of culture life: people believe that a consumer orientation on life assures fortune and fulfillment and is even an indicator of success (Johnson 2009).

Based on a widely disseminated assumption, a huge house is the key to success. People buy houses that they well never be able to pay for or that are simply too large for them. This kind of thinking brought many people and even certain banks to a financial downfall. Again, based on a similar assumption about how new things help people feel good, people buy automobiles, clothing, equipment meant for entertainment and throw parties often spending more than they earn or will be able to earn in the near future. This erroneous albeit widely spread, banal idea (that happiness comes with acquiring new things) leads people and even entire countries into bankruptcy. Much too rarely, people attempt to learn what will truthfully assure satisfaction and well-being in the long run. It is necessary to change the assumptions about values and the culture essentially. First people must try to know themselves better. Only then can it become possible to assure a better sphere of morality (culture) for contemporary society (Johnson 2009).

Taxes get raised. Salaries are too low. Retirement pensions are decreased. All this truly makes for a depressive mood; however, the greatest danger lurks elsewhere. The greatest misfortune most Lithuanians suffered is placing all their hopes on material well-being alone. An irresponsible media also generated such

an illusion by constantly bringing up material goods as a goal. There is only one way out: it is necessary to worry more about spiritual health than we worry about material well-being. A person is hopeless until he/she can grasp this. Those who believe in Christ need to follow the gospel faithfully. Then it will become possible to live through all kinds of crises painlessly (Argust 2010).

3.6. Certain means proposed by the EU and USA to lessen the crisis

The goal is to provide specific recommendations to Lithuania on how to best manage the crisis in the construction and real estate market. Therefore a discussion about what the EU and the USA propose regarding this issue ensues.

Swedish construction companies that have faced the 1990 economic crisis went on the path of enlarging companies (the stronger ones bought up the bankrupting ones) and leaving foreign markets. The large construction companies moved up to 55 percent of their production to other countries, mostly to the United States.

The state not only regulates the construction process directly by setting the rules of the game but it can also operate in the direction of their financial policies. For example, Sweden can get credits and state subsidies easily; additionally the strong economy in the latter half of the 1980s brought a boom of investments into the construction sector, which reached its peak in the 1990s, when a total of 69,600 objects were built. Early in the 1990s, during the crisis, construction dropped, caused primarily by the 1990–1991 reform directed at eliminating state subsidies. The economy normalized; however, residential construction never rose above the ground – there were 13,000 objects built in 1999. The growth later was not distinct: during 2000–2001, the number of newly built residential construction objects did not reach 20,000. After 2002 the situation stabilized, and the capacity of new residential construction grew reaching 45,300 objects in 2006, mostly caused by rising demand and prices.

The most important goal of the government during the short period when consumers as much as companies and investors are reacting overly negatively to the economic situation should be the lessening of negative social consequences caused by unemployment. Although the crisis is a good time for governmental management to lower expenses, it is essential to maintain a balance by increasing investment expenses, for example, by borrowing funds for implementing public infrastructure projects.

All EU countries are forming anti-crisis plans to revive the construction sector and allocating investments for this. The means certain countries are applying are summarized and systematized in Table 3.2.

Table 3.2. Means foreseen to revive the construction sector by EU countries

Country	Main means
Denmark	Main means
	Lower the interest rate (0.25%) aiming to revive the housing market
	Financing infrastructure and green projects
	Construction of social housing
	Building renovations
Spain	Infrastructure projects
	Construction sector grants (an investment of 11 billion Euros in general for economic revival)
France	26 billion Euros allocated for economic revival
	Tax exemptions
	Infrastructure investments
	1.9 billion Euro investments for housing construction and renovations
	80 million. Euro for prison and court building renovations
	Bank loan guarantees
Netherlands	6 billion Euro allocated for economic revival
	200 billion Euro guarantees for banks to revive loan provisions
	Lower VAT from 21% to 6% for the construction sector
	Heat insulation and renovations for public buildings
	400 million Euros to restructure older districts and renovate public spaces
	Support for small companies
	64 million Euros for laborer training and requalification
	Gathering statistics on construction sector job losses to retain labor for post-crisis
	Refusal to increase VAT and excise taxes
	Lowering the tax burden for small businesses
	Promote exports
Germany	50 million Euros allocated for economic revival
	Infrastructure investment projects
	Renovations of public buildings
	Housing renovations
	Tax decreases
Sweden	2.1 billion Euros allocated for economic revival
	Education and training for creating new jobs
	Infrastructure investment projects
	50% tax break for individual home construction, restoration or modernization

3.7. Decision support system for analyzing construction competitiveness

A decision support system for analyzing construction competitiveness was developed by these authors. Their basis for the development consisted of the methods, know-how, expertise and decision support systems in the area of analyzing construction and real estate crisis management. Furthermore it also consisted of the construction and real estate crises models recommended by these authors and the four decision-making methods, which they had also developed.

This system is compiled with a data base and a data base management system, models base and models base management system and user interface (see Figure 3.7).

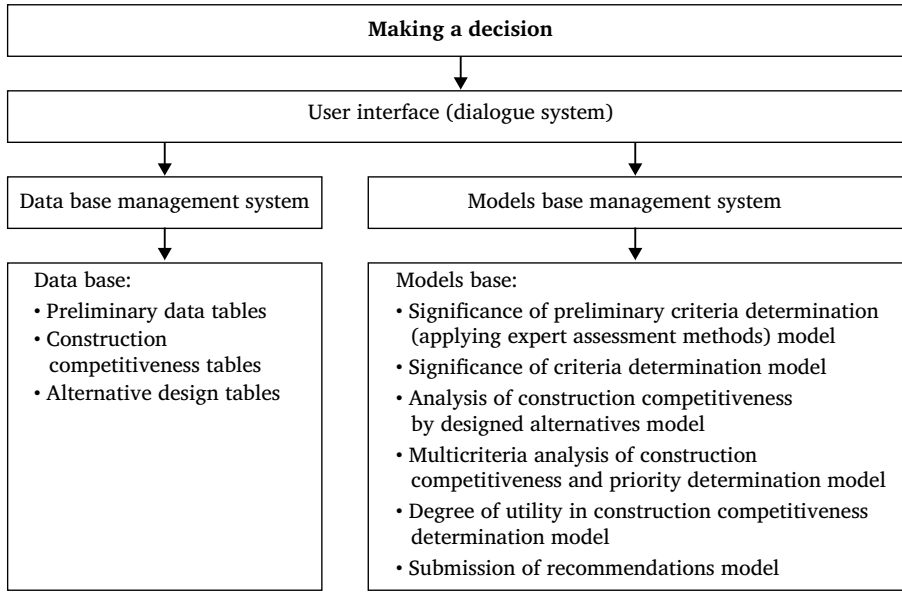


Figure 3.7. Decision support system for analyzing construction competitiveness and its composite parts

The process of crisis management in construction and real estate involves interested groups such as clients, users, designers, subcontractors, suppliers, maintenance organization, municipalities, banks, the *Seimas* parliamentary body, Government and others whose goals, needs, functions, possibilities and experiences differ. Therefore the viewpoints of such interested groups often do not coincide when making decisions. An objective to achieve comprehensive descriptions of alternatives under discussion often requires their write-ups on the basis of economic, legal, social, technical, technological and other kinds of information.

Such information must be submitted to the user in the most understandable form.

The information needed to make decisions within the construction and real estate sector (CRES) system for competitiveness analysis assistance (CAA) can be submitted in digital, textual or graphic forms (schematics, graphics, diagrams, drawings, drafts) as well as in formulas, photographs, audio and video and other kinds of forms. For example, the use of information submitted in digital form entails including the criteria system, units of measurement, significances and initial meanings for exhaustive descriptions of presented alternatives. Use of information submitted in textual form entails presenting alternatives and exhaustive written descriptions of conceptual criteria, their reasons and their substantiation by which the significances, meanings and the like of specific criteria are grounded.

This way the CRES-CAS System forms conditions for a decision-maker to receive full-fledged, exhaustive, quantitative and qualitative information about crisis management from data bases that the models base substantiates and permits flexibly analyzing these factors and making decisions.

Data base

An analysis of the applicability of data base structures for decision-making support systems by the type of problem that needs resolution makes it possible to distinguish their levels of effectiveness for use. There are three fundamental data base structures: hierarchical, network and relational. The CRES-CAS System employs the relational data base structure. The information from the relational data base is retained in table form. The data base of the CRES-CAS System consists of the following types of tables:

- Preliminary data tables submit general information about their existing situation and the composite parts of crisis management as well as crisis management goals and their significances.
- Crisis management decision-making assessment tables submitting quantitative and conceptual information on alternative crisis management decisions including economic, legal, political, managerial, ethical, religious, traditional, educational, social, cultural, psychological and other variants.
- Alternative designs tables submit quantitative and conceptual information on the interrelationships, compatibility and possible combinations of the composite parts in the life process of construction and real estate crisis management and information on the complex designs of alternatives in crisis management.
- Crisis management recommendations tables submit quantitative and conceptual information on alternative crisis management recommendations (economic, legal, political, managerial, ethical, religious, traditional, educational, social, cultural, psychological and emotional aspects of crisis

management, a quantitative assessment of the beginning of a crisis and current global trends (vicious cycle trends, economic and financial trends, qualitative trends).

- Crisis management alternative designs of recommendations tables submit quantitative and conceptual information on the interrelationships, compatibilities and possible combinations of recommendations and information on designing complexes of alternative recommendations.
- Crisis management recommendations assessment tables submit quantitative and conceptual information on alternative crisis management decisions.

Possible alternative recommendations must be examined in order to design and implement effective crisis management recommendations. It is essential to compile the composite parts of alternative recommendations as well as their decision-making interrelationships, compatibilities, combinations and alternatives designs tables to be able to perform automatic alternative designs. The System can compile numerous alternative variants based on preliminary data according to the offered alternative designing method. It is determined whether or not the compiled alternative recommendations conform to the raised requirements. Any alternative that does not conform to the requirements is not considered any longer. When alternative recommendations are being designed, the issue of the significance of the compatibilities of the criteria arises. In this case, when alternatives are assessed in sets, the size of the significance of a specific criterion depends on the entirety of the criteria being assessed, their significances and their preliminary meaningfulness.

Models base

Since the effectiveness of alternative recommendations are often assessed from economic, legal, political, managerial, ethical, religious, traditional, educational, social, cultural, psychological, emotional and other positions, there must be models within the decision-making support system models that help a decision-maker perform a complex analysis of such alternatives and make a decision. The following models comprising a models base perform this function in the CRES-CAS System:

- construction and real estate crisis management alternatives compilation model;
- preliminary establishment of criteria significances (applying expert assessment methods) model;
- establishing criteria significances model;
- construction and real estate crisis management alternative designing model;
- multi-criteria analysis and priority establishment model;
- establishing degree of usefulness model;
- recommendations alternatives compilation model;

– recommendations alternatives designing model;
– submitting construction and real estate crisis management recommendations model.

These models are the basis of the CRES-CAS System by which it automatically compiles variations of construction and real estate crisis management recommendations alternatives, performs their multi-criteria analysis, establishes the degree of usefulness and selects the most effective alternatives.

Various models can be applied for using the models base management system to suit the need of a user.

Further a model for compiling alternative recommendations on crisis management in the Construction and real estate branch is briefly presented as an example.

Model for Compiling Alternative Recommendations for Crisis Management in the Construction and Real Estate branch (Recommendations heretofore).

The structure of the *relational database* is best suited for compiling the model of alternative recommendations. Information in relational databases is stored in tables. Each table is given a name, which is then stored in the computer's external memory as a separate file. The common indexes of these tables link them amongst one another logically. Thereby the entirety of the logically linked tables comprises the relational model.

The formation of the model for compiling variants of recommendation alternatives (decision-making matrices) is on the basis of seven stages:

1. The screen displays the following areas of analysis for the construction and real estate branch:

Construction and real estate branch	Residence	Administrative building	Trading building
Services building	Hotels	...	Production and industrial building

Figure 3.8. Analysis areas in the construction and real estate branch

A user is asked which area in the construction and real estate branch he/she would like to analyze. Let's assume the user wishes to analyze all the areas in the construction and real estate branch in the database. In this case, the system assists the user to form data, information and knowledge about possible alternative recommendation sequentially (starting with the construction and real estate branch and ending with production and industrial building).

Henceforth data, information and knowledge are formed, which comprehensively describe each composite part of the construction and real estate branch until Stage 6 (see Figure 3.14). These stages are submitted in brief further in the discussion on the compilation of alternative recommendations for crisis management in construction and real estate, as an example.

2. The screen of the monitor submits the criteria system describing the competition in the construction and real estate branch, the explicit and tacit knowledge about each criterion (its definition and what aspects of the criterion under discussion) in different (digital, text, formula, video tape, graph) forms (see Figure 3.10).

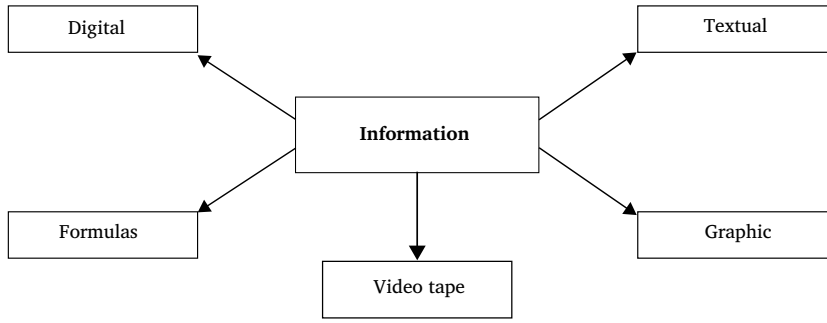


Figure 3.9. Dialogue between the system and user while forming explicit and tacit knowledge comprehensively describing the recommendations

Criteria system describing competition in the construction and real estate branch	Explicit and tacit knowledge about a criterion
Change in GDP (%) compared to prior year (x_1)	$\check{z}_1$
Change in construction jobs (%) compared to prior year (x_2)	$\check{z}_2$
Change in issued construction permits (%) compared to prior year (x_3)	$\check{z}_3$
Change in civil engineering jobs (%) compared to prior year (x_4)	$\check{z}_4$
Change in construction price index (%) compared to prior year (x_5)	$\check{z}_5$
Change in number of employees in the construction sector (%) compared to prior year (x_6)	$\check{z}_6$
Amount of average compensation for construction employees (x_7)	$\check{z}_7$
Level of unemployment in construction (x_8)	$\check{z}_8$
Legal environment (x_9)	$\check{z}_9$
Demographic environment (x_{10})	$\check{z}_{10}$
Social environment (x_{11})	$\check{z}_{11}$
Cultural environment (x_{12})	$\check{z}_{12}$
Ethical environment (x_{13})	$\check{z}_{13}$
Psychological environment (x_{14})	$\check{z}_{14}$
Religious environment (x_{15})	$\check{z}_{15}$
Confidence environment (x_{16})	$\check{z}_{16}$
Emotional environment (x_{17})	$\check{z}_{17}$

Example: Change in issued construction *permits* (%) compared to prior year (x_3)
Number of granted permits for new residential buildings in Lithuania (Eurostat) and New Privately Owned Housing Units in USA (US Census Bureau). U.S. Census Bureau. Manufacturing, mining, and construction statistics. http://www.census.gov/const/www/newresconstindex.html

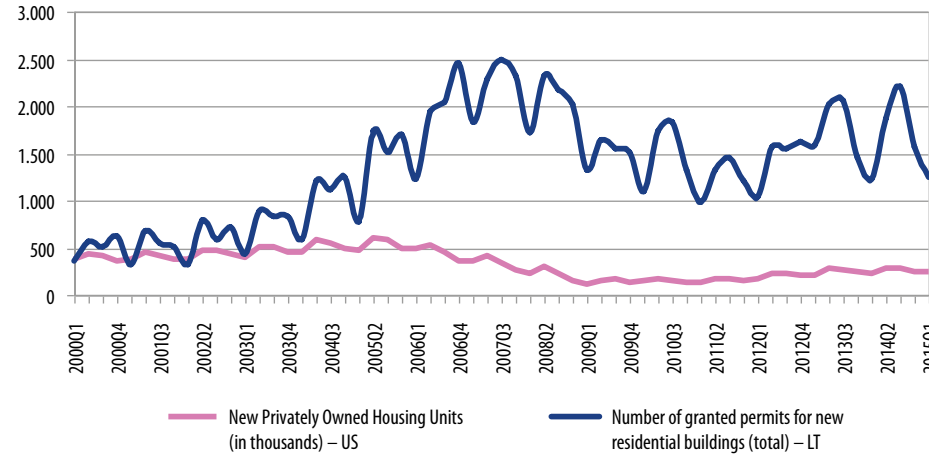


Figure 3.10. Criteria menu describing competition in the construction and real estate branch

The user selects the most appropriate criteria about the competition in the construction and real estate branch for further analysis along with the information describing them. When necessary the user can use supplemental criteria along with the data, information and knowledge describing them. The selected criteria system (x_m) is stored in the computer's memory.

3. The monitor's screen submits the units of measure and the preliminary average significances of these criteria as per expert suggestions. The reasons for suggesting these specific significances and measurement units are also indicated (see Figure 3.11).

Criterion	Unit of criterion measure	Preliminary average criterion significances per expert suggestion	Reasons for establishing these units of measure and significances
x_1 x_2 ... x_m	d_1 d_2 ... d_m	q_1 q_2 ... q_m	s_1 s_2 ... s_m

Figure 3.11. Criteria menu of significances and units of measure

If desired the user can adjust the preliminary criterion significances and units of measure suggested by experts. When supplemental criteria are entered, the user provides units of measure and preliminary significances for them as well as the data, information and knowledge describing them. This information is stored in the computer's memory.

Next possible alternative recommendations are compiled for each mentioned criterion (see Figures 3.10 and 3.11).

4. The monitor's screen submits recommendations for increasing competitiveness in the construction and real estate sector, the significances of the criteria describing them as well as their descriptions (see Figure 3.12).

Alternative ecommendation	Description of recommendation	Significance of descriptive criteria	Meaning of criteria significance	Description of criteria meanings and significances
x_1 x_2 ... x_m	a_i a_1 a_2 ... a_m	$x_{11}\, x_{21} \dots x_{n1}$ $x_{12}\, x_{22} \dots x_{n2}$ ... ... $x_{1m}\, x_{2m} \dots x_{nm}$	q_i q_1 q_2 ... q_m	$p_{11}\, p_{21} \dots p_{n1}$ $p_{12}\, p_{22} \dots p_{n2}$ ... ... $p_{1m}\, p_{2m} \dots p_{nm}$

Figure 3.12. Alternative recommendations and menu of information describing them

Users select alternative recommendations for further discussion in consideration of their goals, needs, functions, opportunities and experience. Additionally the user considers the provided explanations (the reason why specific qualitative meanings of the criteria were provided) and can change the qualitative meanings of the criteria. If supplemental criteria were used, the user enters the definitive data, information and knowledge about them. This table is saved in the computer's memory.

5. The monitor's screen submits a fragment of the relational database of macro-level recommendations (see Figure 3.13). A relational database of micro and mezzo-level recommendations is analogically compiled.

The meanings of the indicators for the alternative macro-level recommendations appear in the first table, shown as Figure 3.13. The second table submits the interactions of the recommendations at the macro-level. The third table submits the opinions of the interested groups about the rationality of the recommendations at the macro-level. The recommendation indexes interconnect all these three tables.

6. The user has formed all the digital, textual, graphic, visual and formulae information that comprehensively describes the alternative recommendations in Stages 1–5. Thereby the decision-making matrix of recommendations and the knowledge describing them is formed (see Figure 3.14). This comprises the basis on which the system is able to determine the most effective recommendations.

If the user uses supplemental alternative recommendations (which are not in the database), he/she must use the explicit and tacit knowledge comprehensively describing them in the decision-making matrix.

Meanings of descriptive indicators for macro-level alternative recommendations							
Recommendation indexes	Price	Legal assess-ment	Political assess-ment	Social assess-ment	Psychological and emotional assessment	...	Ethical assess-ment
001	k_1	$š_1$	g_1	m_1	e_1	i_1	f_1
002	k_2	$š_2$	g_2	m_2	e_2	i_2	f_2
...	...	...	...	...	...	...	...
00*n*	k_n	$š_n$	g_n	m_n	e_n	i_n	f_n

Macro-level compatibility of recommendation interactions			
Recommendation indexes	Alternative recommendations on other industrial sector developments	...	Alternative recommendations on national social policy developments
001 002 ... 00*n*	$l_{11}\ l_{21} \dots l_{m1}$ $l_{12}\ l_{22} \dots l_{m2}$ ... ... $l_{1n}\ l_{2n} \dots l_{mn}$	... ...	$t_{11}\ t_{21} \dots t_{m1}$ $t_{12}\ t_{22} \dots t_{m2}$ ... ... $t_{1n}\ t_{2n} \dots t_{mn}$

Opinions of interested groups on the rationality of macro-level recommendations				
Recommendation indexes	Contractors	Politicians	...	Residents
001 002 ... 00*n*	$g_{11}\ g_{21} \dots g_{m1}$ $g_{12}\ g_{22} \dots g_{m2}$ ... ... $g_{1n}\ g_{2n} \dots g_{mn}$	$p_{11}\ p_{21} \dots p_{m1}$ $p_{12}\ p_{22} \dots p_{m2}$ ... ... $p_{1n}\ p_{2n} \dots p_{mn}$	... ...	$d_{11}\ d_{21} \dots d_{m1}$ $d_{12}\ d_{22} \dots d_{m2}$ ... ... $d_{1n}\ d_{2n} \dots d_{mn}$

Figure 3.13. Fragment of the relational macro-level recommendations database structure

7. Recommendation databases (tables) and decision-making matrixes are analogically formed (by Stages 1–6) for the other composite parts of the construction and real estate branch under discussion.

Alternatives under consideration need to be comprehensively described to make a decision that effectively compromises all necessary aspects. This frequently requires descriptions based on economic, legal, social, aesthetic, comfort, technical, technological and other sorts of information. This information needs to be submitted in a form that is understandable to a consumer/user.

Explicit and tacit knowledge describing the alternative recommendations									
Criteria under discussion	*	Significance	Units of measure	Recommendations under discussion x_1 x_2 ... x_j ... x_n					
	$\check{z}_1$	q_1	d_1	x_{11}	x_{12}	...	x_{1j}	...	x_{1n}
Quantitative	$\check{z}_2$	q_2	d_2	x_{21}	x_{22}	...	x_{2j}	...	x_{2n}
criteria	...	...	...	...	...	...	...	...	...
	$\check{z}_i$	q_I	d_i	x_{i1}	x_{i2}	...	x_{ij}	...	x_{in}
	...	...	...	...	...	...	...	...	...
	$\check{z}_t$	q_t	d_t	x_{t1}	x_{t2}	...	x_{tj}	...	x_{tn}
	$\check{z}_{t+1}$	q_{t+1}	d_{t+1}	$x_{t+1\,1}$	$x_{t+1\,2}$	...	$x_{t+1\,j}$	...	$x_{t+1\,n}$
Qualitative	$\check{z}_{t+2}$	q_{t+2}	d_{t+2}	$x_{t+2\,1}$	$x_{t+2\,2}$	...	$x_{t+2\,j}$	...	$x_{t+2\,n}$
criteria	...	...	...	...	...	...	...	...	...
	$\check{z}_i$	q_I	d_i	x_{i1}	x_{i2}	...	x_{ij}	...	x_{in}
	...	...	...	...	...	...	...	...	...
	$\check{z}_m$	q_m	d_m	x_{m1}	x_{m2}	...	x_{mj}	...	x_{mn}

∗ The denotation $\check{z}_i$ (+ (–)) indicates that the meaning of the criterion is, respectively, more (less) suitable for the demands made by interested groups.

Figure 3.14. Decision-making matrix of alternative recommendations and the knowledge describing them

The level of effectiveness of the construction branch depends on some certain number of variables at micro-, meso- and macro levels. Although macro-level factors affect the level of effectiveness of all the industries of a country, this research is limited to analyzing the effect on the effectiveness of the construction branch alone. The effectiveness of operations in the construction branch depend on the complex of actions by variable, macro-level factors, including a country's level of economic, political and cultural development; acts regulating operations in the construction branch; the market; system of taxation; possibilities and conditions for receiving loans; inflation and local resources. The opportunities for development in the construction branch change in consideration of the impact by the entirety of such macro-level factors.

The construction indicators (excepting employees since they pay taxes and the like) that are traditionally used for various reasons do not give a realistic picture of the situation in construction, its effectiveness and the quality of the work performed therein. Examples illustrating this are provided next. Calculations of

most construction indicators (quarterly and annual data on work performed by construction companies, quarterly and annual data on constructed buildings and so forth) are done after construction production has been sold. The construction production that is not sold is not included in a country's GDP. During a time of crisis in the construction sector, there are many constructed but unsold buildings. Furthermore the sizes of the shadow economies in the countries under discussion differ, making them very difficult to assess directly.

As seen frequently construction indicators do not fully express the realistic situation in construction. For a more qualitative assessment of conditional effectiveness of construction in specific countries, the authors here recommended comparing the complex of construction indicators from various European countries amongst themselves through the prism of GDP. For example, the GDP of Lithuania dropped by 14.7 percent in 2009 while, at the same time, the capacity of construction production dropped by as much as 46.1 percent. Thus it is clear that the competitiveness of Lithuania's construction branch is lower than average for the country due to various economic, political, legal, psychological, emotional, moral and other sorts of reasons. Meanwhile, if the GDP of the Czech Republic dropped by 4.1 percent in 2009, while the capacity of its construction production dropped by 3.2 percent during the same time, it is obvious that the construction branch of the Czech Republic is more competitive than is the average industry in the country.

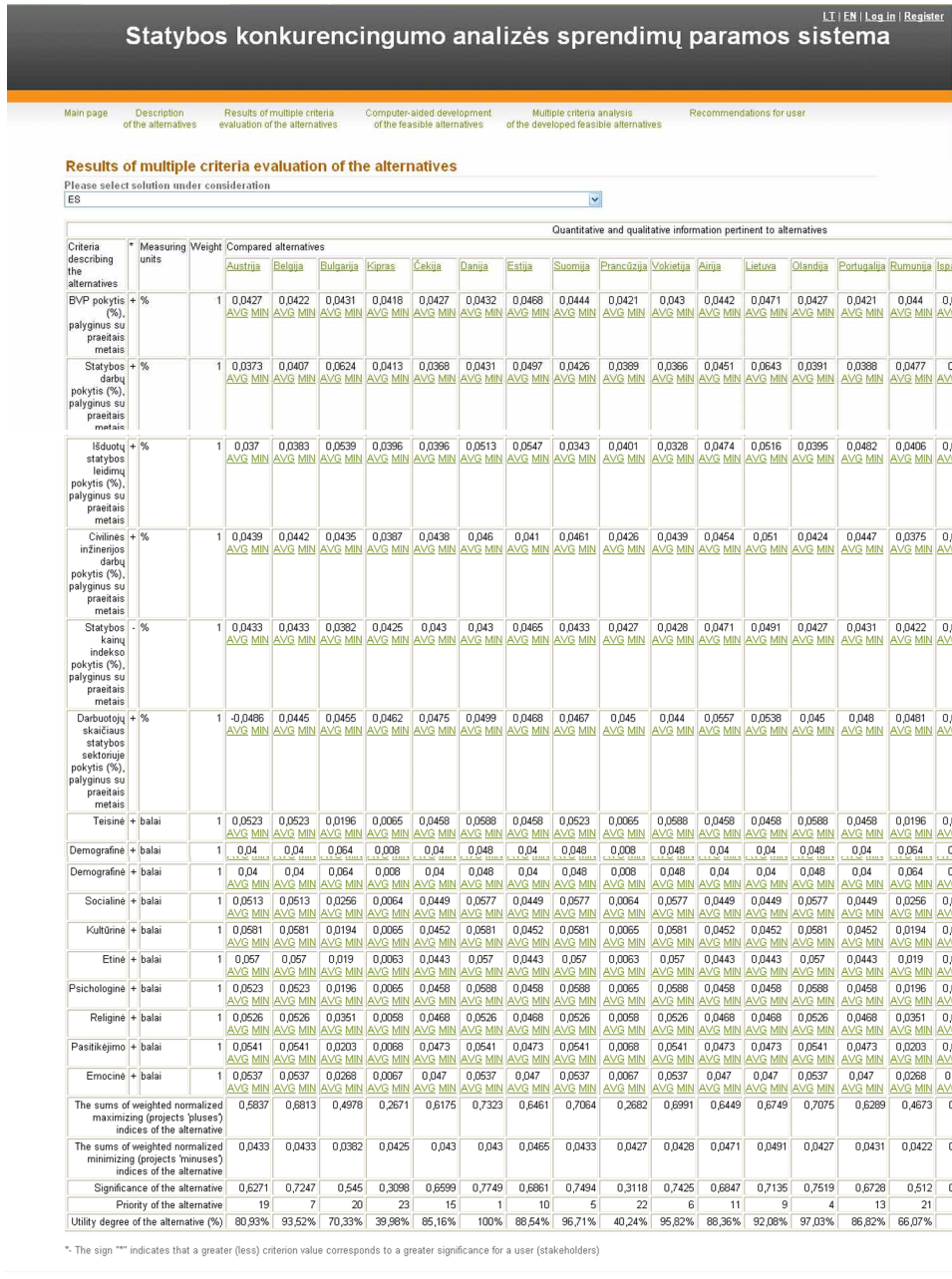
An analysis of the competitiveness of the construction branch of 23 European countries was performed on the basis of a system of 15 quantitative and qualitative criteria (see Table 3.3). The first six indicators were taken from Eurostat data bases. This research was performed by Simona Kildienė, a doctoral student at Vilnius Gediminas Technical University. The authors of this research hypothetically compiled the remaining nine quantitative indicators. A multicriteria analysis of this data was performed with the decision support system for analyzing construction competitiveness. The results of this analysis are presented in Figure 3.15.

Table 3.3. Analysis of construction branch competitiveness in 23 European countries, preliminary data

No.	Country	1. GDP change compared to last year, by %	2. Change in construction work compared to last year, by %	3. Change in issued construction permits compared to last year, by %	4. Change in civil engineering works compared to last year, by %	5. Change in construction price index compared to last year, by %	6. Change in number of employees in the construction sector compared to last year, by %
		max	max	max	max	min	max
1	Austria	–3,9	–1,8	–9,3	–3,1	0,6	–1,1
2	Belgium	–2,8	–11	–13,2	–3,9	–1,1	–0,8
3	Bulgaria	–4,9	–70,3	–59,3	–2,3	10,9	–3,1
4	Cyprus	–1,7	–12,7	–17,1	9,0	0,8	–4,7
5	Czech Republic	–4,1	–0,5	–17,2	–2,9	–0,3	–7,6
6	Denmark	–5,2	–17,5	–51,7	–8,2	–0,4	–13,1
7	Estonia	–13,9	–35,6	–61,8	3,5	–8,5	–6,0
8	Finland	–8,2	–16,2	–1,5	–8,3	–1,1	–5,7
9	France	–2,6	–6,0	–18,5	–0,1	0,4	–2,0
10	Germany	–4,7	0,1	3,0	–3,3	0,1	0,3
11	Ireland	–7,6	–22,9	–40,1	–6,7	–9,9	–26,1
12	Lithuania	–14,7	–75,3	–52,6	–19,9	–14,5	–21,8
13	Netherlands	–3,9	–6,7	–16,7	0,4	0,3	–1,9
14	Portugal	–2,5	–5,9	–42,6	–5,0	–0,7	–8,8
15	Romania	–7,1	–30	–20,1	11,9	1,5	–9,0
16	Spain	–3,7	–9,2	–51,0	2,5	1,0	–24,9
17	Sweden	–5,3	–4,2	–11,1	–1,7	2,0	–4,2
18	Slovenia	–8,1	–33,1	–29,7	–5,9	–2,8	–2,3
19	United Kingdom	–4,9	–11,9	–24,0	13,6	–7,5	–12,2
20	Greece	–2,3	–16,1	–25,5	–12,7	–0,3	–2,6
21	Latvia	–18,0	–43,7	–40,2	–0,5	–6,2	–3,6
22	Hungary	–6,7	–3,5	–34,0	–6,0	3,0	–19,1
23	Poland	1,7	6,6	–23,6	–1,2	0,2	3,6

Table 3.3 continued

No.	Country	Qualitative macro-level environment in the construction and real estate sector during a crisis								
		7. Legal	8. Demographic	9. Social	10. Cultural	11. Ethical	12. Psychological	13. Religious	14. Trust	15. Emotional
		max	max	max	max	max	max	max	max	max
1	Austria	8	5	8	9	9	8	9	8	8
2	Belgium	8	5	8	9	9	8	9	8	8
3	Bulgaria	3	8	4	3	3	3	6	3	4
4	Cyprus									
5	Czech Republic	7	5	7	7	7	7	8	7	7
6	Denmark	9	6	9	9	9	9	9	8	8
7	Estonia	7	5	7	7	7	7	8	7	7
8	Finland	8	6	9	9	9	9	9	8	8
9	France									
10	Germany	9	6	9	9	9	9	9	8	8
11	Ireland	7	5	7	7	7	7	8	7	7
12	Lithuania	7	5	7	7	7	7	8	7	7
13	Nether-lands	9	6	9	9	9	9	9	8	8
14	Portugal	7	5	7	7	7	7	8	7	7
15	Romania	3	8	4	3	3	3	6	3	4
16	Spain	7	5	7	7	7	7	8	7	7
17	Sweden	9	6	9	9	9	9	9	8	8
18	Slovenia	8	8	8	8	8	7	8	7	6
19	United Kingdom	9	6	9	9	9	9	9	8	8
20	Greece	7	7	7	7	7	6	7	7	6
21	Latvia	6	5	6	6	7	6	8	6	7
22	Hungary	6	5	7	6	7	7	7	7	7
23	Poland	7	6	6	6	7	7	7	7	7



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Statybos konkurencingumo analizės sprendimų paramos sistema

Main page | Description of the alternatives | Results of multiple criteria evaluation of the alternatives | Computer-aided development of the feasible alternatives | Multiple criteria analysis of the developed feasible alternatives | Recommendations for user

Results of multiple criteria evaluation of the alternatives

Please select solution under consideration

ES

Quantitative and qualitative information pertinent to alternatives

Criteria describing the alternatives	*	Measuring units	Weight	Compared alternatives															
				Austrija	Belgija	Bulgarija	Kipras	Čekija	Danija	Estija	Suomija	Prancūzija	Vokietija	Airija	Lietuva	Olandija	Portugalija	Rumunija	Isp
BVP pokytis (%), palyginus su praeitais metais	+	%	1	0,0427 AVG MIN	0,0422 AVG MIN	0,0431 AVG MIN	0,0418 AVG MIN	0,0427 AVG MIN	0,0432 AVG MIN	0,0468 AVG MIN	0,0444 AVG MIN	0,0421 AVG MIN	0,043 AVG MIN	0,0442 AVG MIN	0,0471 AVG MIN	0,0427 AVG MIN	0,0421 AVG MIN	0,044 AVG MIN	0,(AV(
Statybos darbų pokytis (%), palyginus su praeitais metais	+	%	1	0,0373 AVG MIN	0,0407 AVG MIN	0,0624 AVG MIN	0,0413 AVG MIN	0,0368 AVG MIN	0,0431 AVG MIN	0,0497 AVG MIN	0,0426 AVG MIN	0,0389 AVG MIN	0,0366 AVG MIN	0,0451 AVG MIN	0,0643 AVG MIN	0,0391 AVG MIN	0,0388 AVG MIN	0,0477 AVG MIN	0 AV(
Išduotų statybos leidimų pokytis (%), palyginus su praeitais metais	+	%	1	0,037 AVG MIN	0,0383 AVG MIN	0,0539 AVG MIN	0,0396 AVG MIN	0,0396 AVG MIN	0,0513 AVG MIN	0,0547 AVG MIN	0,0343 AVG MIN	0,0401 AVG MIN	0,0328 AVG MIN	0,0474 AVG MIN	0,0516 AVG MIN	0,0395 AVG MIN	0,0482 AVG MIN	0,0406 AVG MIN	0,(AV(
Civilinės inžinerijos darbų pokytis (%), palyginus su praeitais metais	+	%	1	0,0439 AVG MIN	0,0442 AVG MIN	0,0435 AVG MIN	0,0387 AVG MIN	0,0438 AVG MIN	0,046 AVG MIN	0,041 AVG MIN	0,0461 AVG MIN	0,0426 AVG MIN	0,0439 AVG MIN	0,0454 AVG MIN	0,051 AVG MIN	0,0424 AVG MIN	0,0447 AVG MIN	0,0375 AVG MIN	0,(AV(
Statybos kainų indekso pokytis (%), palyginus su praeitais metais	-	%	1	0,0433 AVG MIN	0,0433 AVG MIN	0,0382 AVG MIN	0,0425 AVG MIN	0,043 AVG MIN	0,043 AVG MIN	0,0465 AVG MIN	0,0433 AVG MIN	0,0427 AVG MIN	0,0428 AVG MIN	0,0471 AVG MIN	0,0491 AVG MIN	0,0427 AVG MIN	0,0431 AVG MIN	0,0422 AVG MIN	0,(AV(
Darbuotojų skaičiaus statybos sektoriuje pokytis (%), palyginus su praeitais metais	+	%	1	-0,0486 AVG MIN	0,0445 AVG MIN	0,0455 AVG MIN	0,0462 AVG MIN	0,0475 AVG MIN	0,0499 AVG MIN	0,0468 AVG MIN	0,0467 AVG MIN	0,045 AVG MIN	0,044 AVG MIN	0,0557 AVG MIN	0,0538 AVG MIN	0,045 AVG MIN	0,048 AVG MIN	0,0481 AVG MIN	0,(AV(
Teisinė	+	balai	1	0,0523 AVG MIN	0,0523 AVG MIN	0,0196 AVG MIN	0,0065 AVG MIN	0,0458 AVG MIN	0,0588 AVG MIN	0,0458 AVG MIN	0,0523 AVG MIN	0,0065 AVG MIN	0,0588 AVG MIN	0,0458 AVG MIN	0,0458 AVG MIN	0,0588 AVG MIN	0,0458 AVG MIN	0,0196 AVG MIN	0,(AV(
Demografinė	+	balai	1	0,04	0,04	0,064	0,008	0,04	0,048	0,04	0,048	0,008	0,048	0,04	0,04	0,048	0,04	0,064	0
Demografinė	+	balai	1	0,04 AVG MIN	0,04 AVG MIN	0,064 AVG MIN	0,008 AVG MIN	0,04 AVG MIN	0,048 AVG MIN	0,04 AVG MIN	0,048 AVG MIN	0,008 AVG MIN	0,048 AVG MIN	0,04 AVG MIN	0,04 AVG MIN	0,048 AVG MIN	0,04 AVG MIN	0,064 AVG MIN	0 AV(
Socialinė	+	balai	1	0,0513 AVG MIN	0,0513 AVG MIN	0,0256 AVG MIN	0,0064 AVG MIN	0,0449 AVG MIN	0,0577 AVG MIN	0,0449 AVG MIN	0,0577 AVG MIN	0,0064 AVG MIN	0,0577 AVG MIN	0,0449 AVG MIN	0,0449 AVG MIN	0,0577 AVG MIN	0,0449 AVG MIN	0,0256 AVG MIN	0,(AV(
Kultūrinė	+	balai	1	0,0581 AVG MIN	0,0581 AVG MIN	0,0194 AVG MIN	0,0065 AVG MIN	0,0452 AVG MIN	0,0581 AVG MIN	0,0452 AVG MIN	0,0581 AVG MIN	0,0065 AVG MIN	0,0581 AVG MIN	0,0452 AVG MIN	0,0452 AVG MIN	0,0581 AVG MIN	0,0452 AVG MIN	0,0194 AVG MIN	0,(AV(
Etinė	+	balai	1	0,057 AVG MIN	0,057 AVG MIN	0,019 AVG MIN	0,0063 AVG MIN	0,0443 AVG MIN	0,057 AVG MIN	0,0443 AVG MIN	0,057 AVG MIN	0,0063 AVG MIN	0,057 AVG MIN	0,0443 AVG MIN	0,0443 AVG MIN	0,057 AVG MIN	0,0443 AVG MIN	0,019 AVG MIN	0,(AV(
Psichologinė	+	balai	1	0,0523 AVG MIN	0,0523 AVG MIN	0,0196 AVG MIN	0,0065 AVG MIN	0,0458 AVG MIN	0,0588 AVG MIN	0,0458 AVG MIN	0,0588 AVG MIN	0,0065 AVG MIN	0,0588 AVG MIN	0,0458 AVG MIN	0,0458 AVG MIN	0,0588 AVG MIN	0,0458 AVG MIN	0,0196 AVG MIN	0,(AV(
Religinė	+	balai	1	0,0526 AVG MIN	0,0526 AVG MIN	0,0351 AVG MIN	0,0058 AVG MIN	0,0468 AVG MIN	0,0526 AVG MIN	0,0468 AVG MIN	0,0526 AVG MIN	0,0058 AVG MIN	0,0526 AVG MIN	0,0468 AVG MIN	0,0468 AVG MIN	0,0526 AVG MIN	0,0468 AVG MIN	0,0351 AVG MIN	0,(AV(
Pasitikėjimo	+	balai	1	0,0541 AVG MIN	0,0541 AVG MIN	0,0203 AVG MIN	0,0068 AVG MIN	0,0473 AVG MIN	0,0541 AVG MIN	0,0473 AVG MIN	0,0541 AVG MIN	0,0068 AVG MIN	0,0541 AVG MIN	0,0473 AVG MIN	0,0473 AVG MIN	0,0541 AVG MIN	0,0473 AVG MIN	0,0203 AVG MIN	0,(AV(
Emocinė	+	balai	1	0,0537 AVG MIN	0,0537 AVG MIN	0,0268 AVG MIN	0,0067 AVG MIN	0,047 AVG MIN	0,0537 AVG MIN	0,047 AVG MIN	0,0537 AVG MIN	0,0067 AVG MIN	0,0537 AVG MIN	0,047 AVG MIN	0,047 AVG MIN	0,0537 AVG MIN	0,047 AVG MIN	0,0268 AVG MIN	0 AV(
The sums of weighted normalized maximizing (projects 'pluses') indices of the alternative				0,5837	0,6813	0,4978	0,2671	0,6175	0,7323	0,6461	0,7064	0,2682	0,6991	0,6449	0,6749	0,7075	0,6289	0,4673	0
The sums of weighted normalized minimizing (projects 'minuses') indices of the alternative				0,0433	0,0433	0,0382	0,0425	0,043	0,043	0,0465	0,0433	0,0427	0,0428	0,0471	0,0491	0,0427	0,0431	0,0422	0
Significance of the alternative				0,6271	0,7247	0,545	0,3098	0,6599	0,7749	0,6861	0,7494	0,3118	0,7425	0,6847	0,7135	0,7519	0,6728	0,512	0
Priority of the alternative				19	7	20	23	15	1	10	5	22	6	11	9	4	13	21	
Utility degree of the alternative (%)				80,93%	93,52%	70,33%	39,98%	85,16%	100%	88,54%	96,71%	40,24%	95,82%	88,36%	92,08%	97,03%	86,82%	66,07%	

- The sign "" indicates that a greater (less) criterion value corresponds to a greater significance for a user (stakeholders)

Figure 3.15. Multicriteria analysis results of construction branch competitiveness in 23 European countries

3.8. Crisis thermometer: recommendations for the housing market

Language contains many sayings which link our feelings and behavior towards others to temperature. We might, for example, hold "warm feelings" for somebody, and extend them a "warm welcome", while giving somebody else "the cold shoulder" or "an icy stare" (The social thermometer).

Temperature can be defined as the degree of hotness or coldness of a body or environment. According to the Free Dictionary, an abnormally high condition of body heat caused by illness is a fever. The more heat material absorbs, the more rapidly the atoms within the material begin moving and thus causes a greater the rise in temperature (Zimmerman 2014). A bursting real estate bubble in an overheated housing market (HS) might be compared to an ill person running a fever of 41 °C. Conversely, as the crisis hits and the housing market cools down, it becomes reminiscent of a sick person whose body temperature is too low.

Temperature is a measurement of the average kinetic energy of the molecules in an object or system and can be measured with a thermometer or a calorimeter. It is a means of determining the internal energy contained within a system (Zimmerman 2014). Likewise, a housing market with stored kinetic energy is viable. Here, centigrade (or Celsius), a SI base unit, is employed to measure the temperature of a housing market.

The Crisis Thermometer (CT) provides ratings on a scale in which scores from $T_{min} = 32.0$ ° to $T_{max} = 42.0$ ° indicate a cool/overheating housing market.

The formalized presentation of the research shows how changes in the meso and macro environment and the extent to which the goals pursued by various interested parties are met cause corresponding changes in the housing market's "temperature".

The authors of this article developed CT to measure the level of a HM crisis. Their basis for the development consisted of the methods, above thermometers, decision support and other intelligent systems in the area for analyzing HM crisis management (see Chapter 1). Furthermore the Housing Market Crisis Management Model developed by these authors and the four decision-making methods (Kaklauskas 1999, 2015), which they had also developed, are included.

CT consists of a data base and a data base management system, models base and models base management system and user interface.

Data base

The process of crisis management in HM involves interested groups, such as clients, developers, users, designers, subcontractors, suppliers, maintenance organizations, municipalities, media (radio, television, newspapers, magazines), banks, *Seimas* parliamentary body, the Government and others whose goals, needs, functions, possibilities and experiences differ. Therefore the viewpoints

of such interested groups often do not coincide when making decisions. An objective to achieve comprehensive descriptions of alternatives under discussion often requires their write-ups on the basis of economic, legal, social, technical, technological and other kinds of information. Such information must be submitted to the user in the most understandable form.

The information needed to make decisions with the Crisis Thermometer (CT) can be submitted in digital, textual or graphic forms (schematics, graphics, diagrams, drawings, drafts) as well as in formulas, photographs, augmented reality, audio and video and other kinds of forms. For example, the use of information submitted in digital form entails the inclusion of the criteria system, units of measurement, weights and initial criteria values for exhaustive descriptions of presented alternatives. Use of information submitted in textual form entails presenting alternatives and exhaustive written descriptions of conceptual criteria, their reasons and their substantiation by which the weights, meanings and the like of specific criteria are grounded.

This way the CT forms conditions for a decision-maker to receive full-fledged, exhaustive, quantitative and qualitative information about crisis management from data bases that the models base substantiates and permits flexibly by analyzing these factors and making decisions.

An analysis of the applicability of data base structures for similar systems by the type of problem that needs resolution makes it possible to distinguish their levels of effectiveness for use. There are three fundamental data base structures: hierarchical, network and relational. The CT employs the relational data base structure. The information from the relational data base is retained in table form. The data base of the CT consists of the following types of tables:

- Preliminary data tables submit general information about their existing situation and the composite parts of crisis management as well as crisis management goals and their significances.
- Crisis management decision-making tables submitting quantitative and conceptual information on alternative crisis management decisions, including economic, legal, political, managerial, ethical, religious, traditional, educational, social, cultural, psychological and other factors.
- Alternative design tables submit quantitative and conceptual information on the interrelationships, compatibility and possible combinations of the composite parts over the process of their life relevant to HM crisis management and information on its alternatives.
- Crisis management recommendation tables submit quantitative and conceptual information on alternative crisis management recommendations (economic, legal, political, managerial, ethical, religious, traditional, educational, social, cultural, psychological and emotional aspects of crisis management, a quantitative assessment of the beginning of a crisis

and current global trends (vicious cycle trends, economic and financial trends, qualitative trends).
- Crisis management alternative designs of recommendations tables submit quantitative and conceptual information on the interrelationships, compatibilities and possible combinations of recommendations and information on designing complexes of alternative recommendations.
- Crisis management recommendations assessment tables submit quantitative and conceptual information on alternative crisis management decisions.

Models base

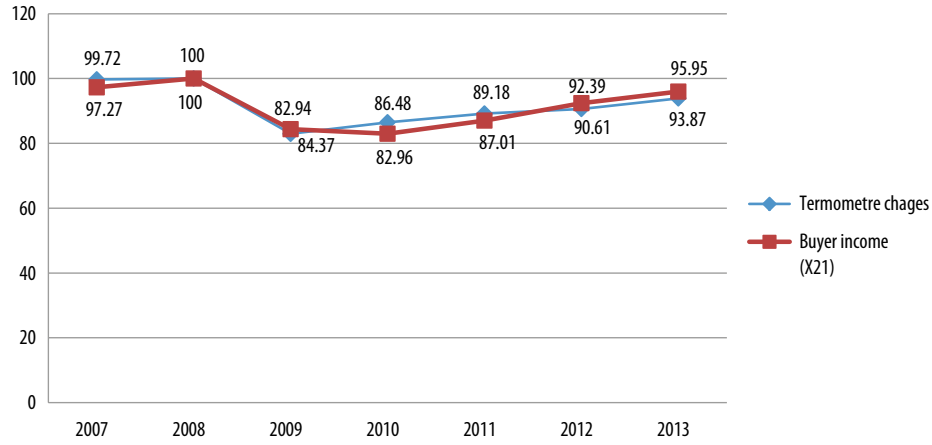
Models must be within a CT helping a decision-maker perform a complex analysis of alternatives and make a decision, since the effectiveness of alternative recommendations are often assessed from economic, legal, political, managerial, ethical, religious, traditional, educational, social, cultural, psychological, emotional and other positions,. The models base consists of the following models performing their respective functions in the CT:

- Housing market (HM) crisis management alternatives compiling model;
- Preliminary criteria weights establishing model (applying expert assessment methods);
- Criteria weights establishing model;
- HM crisis management alternative designing model;
- Multicriteria analysis and priority establishing model;
- Utility degree establishing model;
- HM crisis thermometer model;
- Recommendation alternatives compiling model;
- Recommendation alternatives designing model;
- HM crisis management recommendations submitting model.

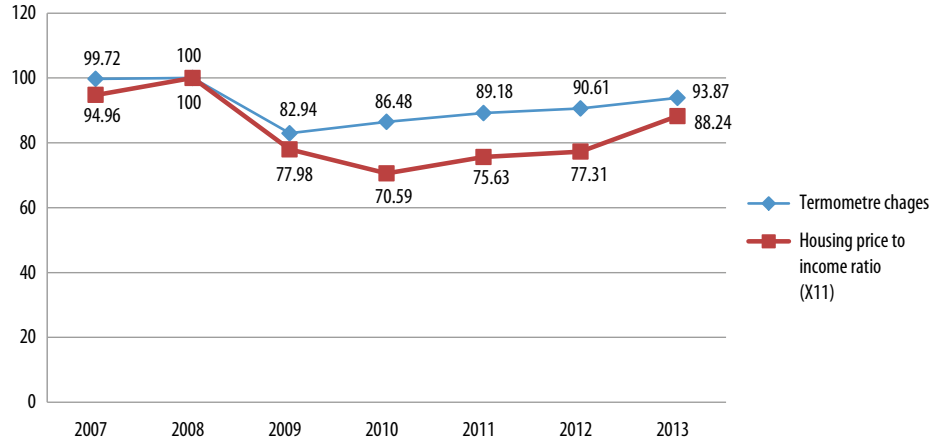
The validation of the Crisis Thermometer

Thermometer that was developed (Kaklauskas *et al.* 2015) on its basis was performed by analyzing whether or not the Crisis Thermometer indicates the "temperature" of Lithuania's housing market sufficiently accurately. The deliberation for this purpose was to determine, if there is a strong, positive linear relationship between "temperature" of the housing market and several of the main indicators of the housing market – the Housing price to income ratio (X_{11}), Buyer income (X_{21}), Construction works (X_{86}) and Investments in the construction sector (X_{87}). "Temperature" and other indicators of the housing market have various dimensions. Thus, to circumvent such a situation, the indicators under discussion have been normalized (see Figure 3.16). The year, when the initial statistical data for the indicator under consideration were highest, is scored 100%. Meanwhile the other statistical data for the same indicator are recalculated proportionately.

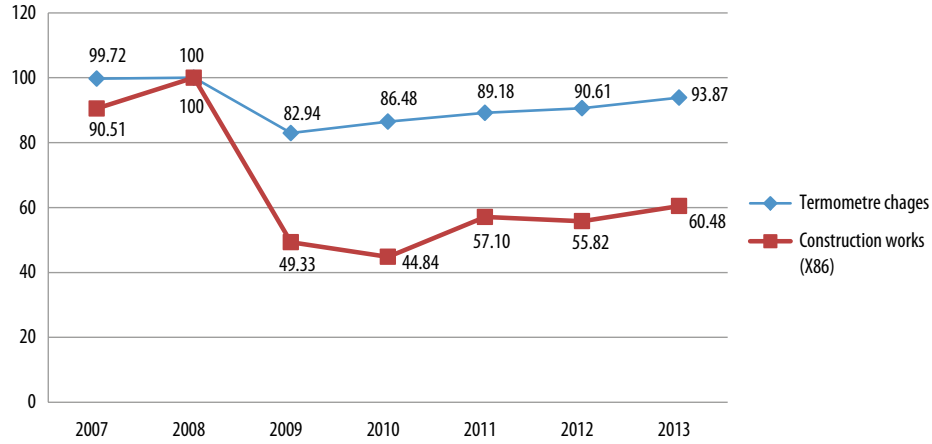
Correlation coefficient = 0.94025



Correlation coefficient = 0.89813



Correlation coefficient = 0.92412



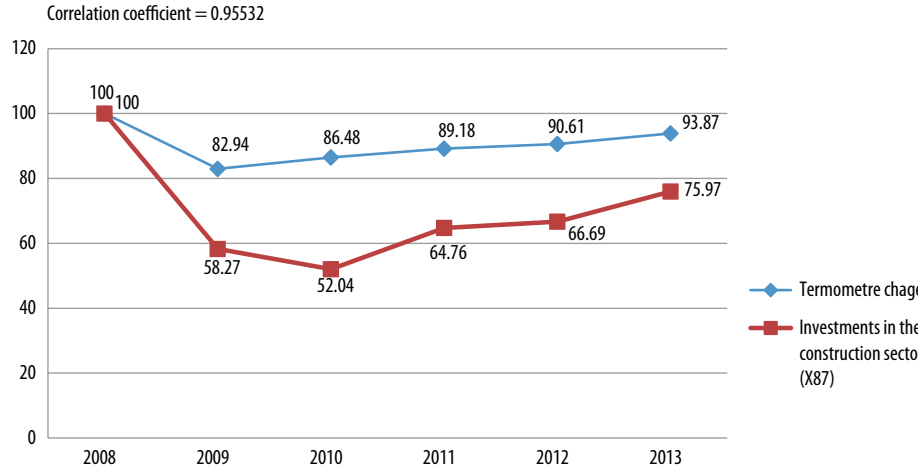


Figure 3.16. Housing market "temperature" calculated by the Model and Crisis Thermometer developed on its basis with the correlation coefficients of several main indicators describing the housing market

Figure 3.16 shows that the "temperature" of a housing market has a strong uphill linear relationship with the following indicators: the Housing price to income ratio (X_{11}, correlation coefficient $r_{11} = 0.89813$), Buyer income (X_{21}, $r_{11} = 0.94025$), Construction works (X_{86}, $r_{11} = 0.92412$) and Investments in the construction sector (X_{87}, $r_{11} = 0.95532$). These strong, positive, linear relationships validate the reliability of the Housing Market Crisis Management Model and the Crisis Thermometer that was developed on its basis.

3.9. Metaphoric approach to different aspects of crisis management

A metaphor is a figure of speech that identifies something as being the same as some unrelated thing for rhetorical effect, thus highlighting the similarities between the two. While a simile compares two items, a metaphor directly equates them, and so does not necessarily apply any distancing words of comparison, such as "like" or "as". A metaphor is a type of analogy and is closely related to other rhetorical figures of speech which achieve their effects via association, comparison or resemblance – including allegory, hyperbole, and simile. The metaphor category also contains these specialised types (Herscberger 1943):

- Allegory: An extended metaphor wherein a story illustrates an important attribute of the subject.
- Catachresis: A mixed metaphor used by design and accident (a rhetorical fault).

- Parable: An extended metaphor narrated as an anecdote illustrating and teaching such as in Aesop's fables, or Jesus' teaching method as told in the Bible.
- Pun: Similar to a metaphor, a pun alludes to another term. However the main difference is that a pun is a frivolous allusion between two different things whereas a metaphor is a purposeful allusion between two different things.

Some theorists have suggested that metaphors are not merely stylistic, but that they are cognitively important as well. In Metaphors We Live By, George Lakoff and Mark Johnson argue that metaphors are pervasive in everyday life, not just in language, but also in thought and action. A common definition of a metaphor can be described as a comparison that shows how two things that are not alike in most ways are similar in another important way. They explain how a metaphor is simply understanding and experiencing one kind of thing in terms of another. The authors call this concept a "conduit metaphor". By this they meant that a speaker can put ideas or objects into words or containers, and then send them along a channel, or conduit, to a listener who takes that idea or object out of the container and makes meaning of it. In other words, communication is something that ideas go into. The container is separate from the ideas themselves. Lakoff and Johnson give several examples of daily metaphors we use, such as "argument is war" and "time is money". Metaphors are widely used in context to describe personal meaning. The authors also suggest that communication can be viewed as a machine: "Communication is not what one does with the machine, but is the machine itself." (Johnson, Lakoff 1980).

Metaphors can also map experience between two nonlinguistic realms. In The Dream Frontier, Mark Blechner describes musical metaphors, in which a piece of music can "map" to the personality and emotional life of a person (Blechner 2001). Musicologist Leonard Meyer demonstrated how purely rhythmic and harmonic events can express human emotions (Meyer 1956).

Art theorist Robert Vischer argued that when we look at a painting, we "feel ourselves into it" by imagining our body in the posture of a nonhuman or inanimate object in the painting. For example, the painting "The Solitary Tree" by Caspar David Friedrich shows a tree with contorted, barren limbs (Blechner 1988). In looking at that painting, we imagine our limbs in a similarly contorted and barren shape, and that creates a feeling in us of strain and distress. Nonlinguistic metaphors may be the foundation of our experience of visual, musical, dance, and other art forms (Johnson, Larson 2003; Whittock 1992).

The traditional analysis of a crisis in construction and real estate is based on economic, legal/regulatory, institutional and political aspects. The social, cultural, ethical, psychological and educational aspects of crisis management tend to receive less attention. To perform an integrated analysis of the life cycle of a

crisis in construction and real estate, the cycle must be analyzed in an integrated manner based on a system of criteria. Such several metaphorical sub-criteria are briefly analyzed below.

Interested groups

Every metaphor that Morgan submits about an organization – as a mechanism, an organism, a political system and the rest – denotes a different view on that organization and its operations as well as its management system (Morgan's Metaphors):

- Organization – it is a human organism consisting of elements of which each one performs its own function. There are vitally important elements (brains and heart as well as the circulatory system). However, there are also those of lesser importance that could even be amputated should the need arise.
- Organization – it is a computer with its greatest importance being the accumulation, storage and dissemination of information. Whosoever holds information is the one who rules the situation.
- Organization – it is an interest group or a religious order, where the spirit of joint work and alliance is most important.
- Organization – it is a miniature state in which relationships between individuals and groups are described as contests and competition, and a battle for governance and influence is foreseen.

Jančiauskas (2011) used the metaphor of an organization as an iceberg while discussing the management of human resources. He explains this metaphor by saying that the formal aspects involved in an organization's functioning consist of merely the visible parts of an iceberg (e.g., structure, number of employees, terms for work compensations and others); meanwhile, the informal aspects constitute the greater part of an iceberg, which remains unseen (microclimate, employee creativity, effectiveness of motivational means and others).

Economic aspects

Various metaphors are used to describe the economic aspects of the real estate crisis: noose of debt, failing real estate market or hitting bottom in housing prices. American economist A. M. Okunas was defining the mechanism for distributing income between the relatively rich and the relatively poor. He spoke about money being transferred from the rich to the poor in a leaky bucket.

Greece is named as the initiator of all the problems in the euro zone, and announcements are made that the troubles, which started here, have also affected the finances of other countries in the euro zone. Several metaphors are used to describe this process, including the "domino effect" by which countries in proximity fall like dominoes and the euro zone being like one huge family so that, when one family member comes down with a virus, the others get sick too (Kaip sustabdyti... 2011).

Legal, political, institutional and administrative aspects

Laws as well as the Constitution were aligned with people's customs and instincts. Honorė de Balzac (1799–1850) wrote, "Customs are people, and the laws – the mind of the country. Conventional morality is often more cruel than the law. Customs, which are sometimes unwise, overcome laws." Anatolius Frans (1844–1924) said that we do not depend at all on constitutions and charters but we are dependent on instincts and customs." Voltaire (1694–1778) believed that a plentitude of laws in a country means the same as a large number of physicians do: "it's a sign of illness or helplessness".

In the opinion of Madame de Staël (1766–1817), "Politics – it's a holy matter, because it connects all the coils acting on social classes and moves them either towards morality or further away from it." Mencius (372–289 BC) said that "when those who are at the top do not adhere to principles, those who are beneath will not uphold the laws." Verlen wrote, "Cruelty is the final tool of a failing government." Meanwhile Ralph Waldo Emerson noted, "Crime and punishment grow out of the same stem."

Time

The sages of olden times knew that many problems disappear over the course of time. Pericles (495–429 BC) would wait for the wise advisor – time. Menander (343–291 BC) stated, "Time heals all wounds." Cicero (106 015043 BC) purported that time gentles grief. Jean de La Fontaine (1621–1695) believed that "sadness flies off on wings of time".

Art, books and emotions

Art has been associated with life by metaphors for already many ages. Voltaire (1694–1778) compared the earth with a gigantic theater, where one and the same tragedy plays each time only by a different name. Albert Einstein (1879–1955) penned, "In scientific thinking are always present elements of poetry. Science and music requires a thought homogeneous".

Bertolt Brecht (1898–1956) held the opinion that "types of art are designated for the greatest of the arts – the art of living on earth." Friedrich Schelling (1775–1854) observed, "Architecture in general is frozen music." George Santayana (1863-1952) accented, "Life – it is not a play and not a holiday; life – it is hard work".

It was believed in all times that the storms of life were sufficiently beneficial. Pythagoras (582–496 BC) stated his opinion, "The goblet of life would be sweet to the point of nausea, if only bitter tears would not drop into it." Voltaire (1694–1778) said, "Misfortune is the greatest school of life." Oscar Wilde (1854–1900) wrote, "There is only one thing in life worse than being talked about, and that is not being talked about".

Metaphors used to describe a person's emotional state of being include a broken heart, put one's heart and soul into it, petrified in fear, I feel like I'm

down to the bare bones, face hard as a rock, empty eyes, unfeeling robot, hang one's head down low, heart as hard as a rock, heart like iron, eaten up with grief, flooded in longing, tears of joy, laughing through one's tears and others.

Nature and fauna

Nature is frequently aligned with the human world. Marcus Aurelius (AD 121–180) offered, "Be like a headland of rock on which the waves break incessantly; but it stands fast and around it the seething of the waters sink to rest." Daniel Defoe (1660–1731) thought, "The height of human wisdom is ... to make a calm within, under the weight of the greatest storm without". Anatole France (1844–1924) wrote, "If we were to demolish all the dreams and illusions people have, the world would lose its form and colors, while we would remain dumb and stupid for ages". In the opinion of Miguel de Cervantes (1547–1616), "Lazy idlers are the same thing in a State as the drones in a hive, that eat up the honey the industrious bees make". Metaphors related to animal life can be found often for expressing something distinguishable or dissimilar. Two such metaphors are black sheep or scapegoat.

Books and acquaintanceship

Books prevented people reading them from breaking down when facing the storms of life during all times. Charles-Louis de Montesquieu (1689–1755) needed only to take up reading to get rid of annoying, unbearable thoughts. He drove away such thoughts by immediately focusing his attention. William Makepeace Thackeray (1811–1863) wrote that books purify the soul, uplift and strengthen a person, awaken someone for noble pursuits, sharpen the mind and soften the heart. John Ruskin (1819–1900) expressed his idea of reading, that it can either strengthen or weaken the mind exactly like air – pure or polluted – affects the body.

Demographic aspects

Metaphors to express demographic phenomena often include such as a demographic hole, brain drain, melting pot of nations, demographic plague, demographic winter, demographic explosion, demographic bomb and others.

The same metaphor can mean entirely opposite things in different parts of the world, e.g., the demographic bomb metaphor. In Europe and Japan, it means the aging of a population and a dramatic decrease in the numbers of their people. However, in Africa, India, China and South America, it means a rapid increase in population numbers (Kuodis 2007).

Metaphors on war, prison and sports

Metaphors were also often applied in reference to war, prison and sports. André Maurois (1885–1967) said, "Business is a combination of war and sport". Pedro Calderón (1600–1681) believed, "Language is the most dangerous weapon of all: a wound made by sword heals more readily than a wound left by a word". Lion Feuchtwanger (1884–1958) wrote, "Fortune has swift legs, whereas

misfortune – wings." Herbert George Wells (1866–1946) held the opinion, "Human history becomes more and more a race between education and catastrophe". Epictetus (55–135) attested, "What prison? – Where he is already: for he is there against his will; and wherever a man is against his will, that to him is a prison". Franz Kafka (1883–1924) expressed his opinion, "It is often safer to be in chains than to be free".

Psychological factors

A tactic often taken in the past to lessen psychological tension in the public was "Napoleonic welfare", whereby the jobless would dig trenches and later fill them up again. Thus they were assured of employment and pay.

Economists also showed over time numerous anomalies in financial markets that do not align with the paradigm of rational expectations. The school of alternative thinking took interest in the sources of irrational bubbles, i.e., factors that were more psychological such as herd instinct, unexpected changes in consumer confidence, speculative enthusiasm, fashion, group pressure, short investor memory and the like. New disciplines of study have even been created – behaviorist finance, which analyzes the anomalies of investor behavior in financial markets, and how these can destine bubbles and the downfall of markets. This school projects that the instability of financial markets, bubbles and downfalls cannot be explained in terms of changes happening in profits, dividends or property valuations – instead, greater attention must be paid to aspects of psychological behavior. This school, which consists of joint studies in economics, psychology and sociology, contributed a great deal to our understanding about what is happening in financial markets (Kuodis 2008).

Ethics

The Phoenix syndrome becomes active during times of financial crisis. The business of construction and real estate becomes less moral. One example is deliberate bankruptcy. Certain builders publicly announce that, due to the crisis, they are suffering tremendous difficulties and are thus unable to repay banks, subcontractors and suppliers. Meanwhile, at the same time, they transfer the greater part of their funds into a newly established company.

Religion

A mistrust of other participants in the market in business relationships has grown due to the crisis. It was enough for the head of a construction company to come to a verbal agreement with a client regarding the capacity of a job prior to the crisis. Documentation would be prepared immediately and materials ordered. Now the parties in a transaction will not begin any actions until a contract is signed, even when they know one another very well. Similar relationships are noticed in the public and the private sectors as well as in public life.

The tendency for a downfall in morality causes anxiety; a crisis will pass, whereas a spiritual demise will have long term consequences. Spe Salvi [English: Saved in Hope], the Pope's Encyclical Letter, did not appear by chance as soon as the first signs of a global economic recession were felt. This document encourages people not to lose hope, even in the most difficult situations in life. Caritas in Veritate [English: Charity in Truth], the new 7th Encyclical Letter of Pope Benedict XVI, is designated for social and economic issues. It is not merely an internal matter of the Church: it is designated for the public-at-large, business companies and executors of complex economic and political processes. It is expected that those who are grappling with these difficult times will comprehend the thought transmitted by the title of this encyclical: charity, which here implies love, sinks into sentimentality without truth, whereas truth without charity seems overly cruel. When well-being is being devised, it must encompass the entire entity of a human being, including that person's dignity and spheres of culture, spirituality and religion, not merely be limited to satisfying a person's physiological needs. The Pope chose the title of his Encyclical as Charity in Truth yearning for the phenomena of mutual respect and love also to be clear in economic relationships, which are beginning to lose any form of humanity. Even the market is unable to perform its function without activities that are founded on solidarity and mutual trust. Advancement cannot be assessed in terms of technological achievements alone. True advancement also encompasses the elements of values – love and truth (Jurevičius 2009).

Security

Lithuanians are beginning to appreciate continual work, even more than a well-paid job. Security has a greater impact on the quality of life than material well-being. Many Lithuanian men believe that they are responsible for their family's well-being. A head of household who holds such an image of a real man does not know anything else except the responsibility to earn as much money as possible. Such men also dive into their work and forget that responsibility does not only mean a material burden; it also means providing loved ones with spiritual comfort and security. However, it is not likely that a man who lacks security himself would be able to provide security for others. Furthermore, where is that security, if it is purported that a man must support the family? A husband becomes someone who is constantly overtired and angry. Perhaps it is better not to force men to become stern warriors only not on a battlefield but in their own families or simply in society. Perhaps then we would have fewer pseudo men of steel who make everyone near to them unhappy, while they ultimately seat themselves into a wheelchair over time (Milašiūnas 2010).

Other areas of human activities

Metaphors were also used to describe many other human activities picturesquely. Epicurus (341–270 BC) believed that "a wise person chooses a friend

who is happy and easy to get along with." Seneca (4 BC–AD 65) suggested "If you can't change it, change your attitude". Joseph Rudyard Kipling (1865–1936) expressed his idea, "Words are, of course, the most powerful drug used by mankind".

3.10. Recommendations to Lithuania's policy-makers and social partners

It is necessary to comprehensively analyze and make rational decisions at micro-, meso- and macro-levels in the effort to reduce the affect of the crisis on Lithuania's construction and real estate sector. This must not only encompass economic, political, legal and institutional types of decisions but also other, qualitative aspects of crisis management, including social, cultural, ethical, psychological, religious, demographic, spiritual and other such aspects. Specific recommendations for avoiding crisis and minimizing its consequences in defined areas are presented next.

Economic, legal, political, organizational and managerial aspects of crisis management:

- The Bank of Lithuania must attempt to formulate a rational sphere of interest rate standards.
- A process of monitoring banks and receiving early warnings on the situation of this sector are essential for achieving financial stability.
- Laws on the issuance of EU loans minimizing the financial risk of irresponsible actions by customers who do not have sufficient financial knowledge and experience must be drawn and passed.
- Borrowing from the IMF abroad must be understood as the final straw to grasp, only when the state is no longer able to receive loans from any other source.
- A model of conservative banking operations assists in lessening the impact of a crisis.
- Procedures for receiving EU financing must be simplified and accelerated.
- The economic aspects of the Multi-unit housing renovation program must be reconsidered. The current economic support is not sufficiently motivating for residents to implement multi-unit housing renovations on a massive scale. This would be a saving grace for the construction sector, which suffered the most from the crisis and which once generated the greatest proportion of GDP.
- A lower VAT rate should be applied for residential housing construction.
- Automatic stabilization, which would automatically increase state expenditures for social welfare area as the economy weakens and decrease taxes.

– The IMF claims that fiscal stimulation reaching at least 2 percent of GDP is necessary to overcome a universal recession.
– Introduction of a rational real estate tax (so the taxes would not be less than administrative expenses, thereby causing the Government to face a harsh wave of public protest) and elimination of tax exemptions would encourage more effective use of real estate and lessen the inflation of a real estate bubble.
– It is essential to form conditions limiting the possibility for interested groups to inflate a bubble artificially. For example, governmental authorities relished the increasing income received from VAT due to the increase in real estate demand. This greatly improved economic indicators, and filled up the national budget for the country. Favorable conditions were also formed for other interested groups for inflating the real estate bubble. Bank administrators received sizeable premiums. Meanwhile, as buyers kept receiving ever greater salaries, they erroneously judged their financial perspectives and boldly took out loans for housing.
– The economy must segment anew, clean up and become more rational. Certain businesses will bankrupt, and certain production resources will become newly segmented.
– What is needed is business not casino capitalism.
– It is necessary to assure continual political stability in Lithuania. The consequences of political instability negatively affect Lithuania's economy, because investors fear a lack of political clarity. Lately such instability also negatively affects the psychological and moral state of the country's residents. Unstable management generally means unfounded reforms, a demise of investments and weaker credit provisions.
– Implementing European public policy standards is recommendable.
– Accelerate and simplify the procedures for using EU funds.
– An analysis of demand for construction products and services in markets that have not fallen as hard or in markets being stimulated by the state should be more actively undertaken.
– Legal conditions must be formed to enact an acceleration of public bidding for purchases in order to accelerate the implementation of construction projects.
– Corruption must be lessened at all levels of the construction and real estate branch.
– It is recommended to cease demanding companies to provide the same information to different institutions.
– Projects under implementation must be completed. It is essential to invest in the infrastructure with priority to projects that already have financing allocated or that have already been started.

– The business environment requires improvement. There is the endeavor to reduce the regulatory burden on businesses to 30% over the next two years in Lithuania. There are plans to reduce the spectrum of activities requiring licensing, eliminate and merge institutions regulating businesses with overlapping functions, ease the procedures for business start-ups and closures and implement abilities for companies to register electronically. There is also intent to be rid of the practice of having businesses submitting the same data several times to differing governmental institutions.
– It is recommended to merge the Labor Exchange and employment agencies into one organization.

Methods, models and the best global experiences:

– New models and methods need to be arranged to foresee and model crises. The earlier ones were not justifiable. Economists have recognized for a long time that psychological factors, fluctuating attitudes of a market, changing trust and other factors can have a huge impact on economic fluctuation. Nonetheless, the current generation of macroeconomic models does not take them into consideration in their analyses. Economic theory and practice have not advanced sufficiently for now to be able to provide an unambiguous answer regarding what should be done. For one, there are many who doubt whether Franklin Delano Roosevelt's means for stimulating public demand, which was intended to fight the depression, were actually efficient. Such people claim it was actually the war that helped bring an end to the depression.
– It is essential to instill the best global practices for managing crises in the construction and real estate sector, including economic, political, legal, technological, institutional, social, cultural, ethical, psychological and similar such means.
– It is recommended to analyze construction and real estate crises in an integrated fashion by applying various disciplines, such as management, economics, law, engineering studies, technology, organizational studies, ethics, aesthetics, psychology, religion, social sciences and the like.

Crisis management aspects involving ethics, religion, traditions, education, the society, culture, psychology and emotions:

– The moral aspects of operations in the construction and real estate branch have been systematically ignored for a very long time. That makes it necessary to apply standards of ethics as broadly as possible in decision-making. An ethical viewpoint must be instilled more and more often in decisions that are made.
– An analysis of ethics in the economy or finance does not necessarily mean the discussion is about breaking laws. The sharp decline of Wall Street and the billions of dollars losses it suffered during the crisis period will not necessarily prompt accusations or law suits against its leaders. All decisions

were made in consideration of the laws in effect at the time. However, their decisions bypassed standards of ethics. Ethics are usually linked to judgments and decisions passed that are not particularly moral (Longstaff 2008). Therefore an ethical perspective is becoming more and more meaningful when resolving effective, transparent and secure issues regarding market development.

– The greatest affliction most Lithuanians suffered was placing all their hopes on material well-being alone. An irresponsible media contributed to generating such illusions as a purpose, consistently bringing up materialistic goods. There is only one conclusion: as one worries about material goods, one must be more concerned about one's spiritual health (Argustas 2010).
– People go out a buy a house on the basis of a widely disseminated presumption that a huge house is the key to happiness. People buy the kinds of houses that are beyond their means. They will never be able to pay for them, because the house they bought is simply too big for them. This kind of thinking brought many people, as well as some large banks, to the brink of financial disaster. It is this erroneous albeit widely disseminated banal idea that a person can feel happy by acquiring some new thing has led people, as well as entire states, to bankruptcy. Far too rarely we people attempt to learn what could actually assure long-term satisfaction and well-being. Thereby we must all essentially change our values and cultural assumptions. First of all, we need to attempt to get to know ourselves better. Only then will we be able to assure a more qualitative, moral and cultural content in today's public sphere (Johnson 2009).
– Performance of crisis management should involve greater consideration of Lithuania's national traditions.
– Education of interested groups needs to be more actively undertaken. Interested groups affected by the crisis must know the history of how the crisis occurred, its consequences and the methods that could be applied to find a more rapid outcome of the situation.
– It is much more difficult to find a job during a period of crisis with a narrow professional or vocational specialty.
– Efforts must be made to adapt the organizational culture (organizational values, beliefs and customs) to the demands the crisis raises as quickly as capabilities permit.
– Organizations need to have a sense of great social responsibility regarding their employees.
– Control over the printing of money must be the most important condition for assuring a reliable economy and a stable social order.
– Efforts must be made to shorten the time of joblessness for each unemployed person by investing in new jobs, applying part-time work by which

the work involves several days of the week and other similar tactics. The longer a potential employee is out of work, the more skills of importance to the market that person loses. Furthermore the psychological states of an unemployed person and his/her family members worsen.

- The conclusions 2010 Nobel Prize Winner in Economics P. Diamond offered in Paris prompted a merger of the labor exchange and employment agencies into one organization. This resulted in somewhat more people finding jobs rather than scattering their efforts around from one office to the other. A person simply approaches one window and registers as unemployed thereby becoming a candidate for all job openings at once. This greatly eased the procedures involved in a job search (Janužytė 2010).
- Since the criteria for consumer selections obviously change during a crisis, businesspeople need to segment the market anew by the emotional reactions of their customers to the crisis (some are more inclined to save, whereas others are not). In one instance, a company selling construction technology and machinery strengthens its leasing segment. When a recession is deep and lasts a considerable time, like it appears to be this time around, consumers experience structural changes in their values, which could change for a lengthy period. Market research will no longer be what it once was. The companies that will be capable of quicker reactions to the process of changing values amongst consumers will come out of the crisis as winners.
- It is recommended to include psychological elements (expectations, waves of optimism and pessimism, periods of overall surges of energy or disillusionment) into the model of fluctuating cycles in the construction and real estate sector endeavoring to examine their impact in this life cycle.
- It is recommended to analyze the economics of happiness when deliberating the crisis. Happiness, positive and negative influences, well-being, quality of life, satisfaction with life and an entity of interrelated elements define the economy of happiness. The fields of economics, psychology and sociology deliberate on the topic of the economy of happiness.
- It is necessary to pay greater attention to means for lessening emotional stress during a crisis.
- Efforts must be made to avoid acute and chronic stress during a period of crisis.
- The retention of an inner state of happiness involves interacting more with closely related and happy persons, living actively and watching less television since it causes various stresses.
- Rationalize the psychological climate seeking rational behavior on the part of interested groups.
- Lessen psychological tension and panic due to a crisis in the making.

Quantitative assessment at the beginning of a crisis:

– Various scholars around the world attempt to determine a quantitative limit, drawing the line where an economic, social or other sort of crisis could begin. Several examples of such quantitative limits are provided next.
– In the opinion of Nouriel Roubini, a professor of economics in the United States, it was not at all the bank failures that set off the financial crisis but rather the price increase of up to 145 USD per barrel of crude oil. An optimal price for crude oil fluctuates between 75-80 USD per barrel. The price limit of danger is at around 100 USD per barrel. Prices above that can cause damages (Janužytė 2010).
– Sad to say but Moody analysts also have no doubts that a rising price for crude oil is the sign of a new economic crisis. They remind that a crisis would hit world markets as soon as the United States would begin spending more than 4 percent GDP annually for crude oil products (Janužytė 2010).
– The countries most troubled by joblessness face a huge threat of protests and unrest. It is difficult to pinpoint the limit at which the public begins making noises. However, such a probability greatly increases, when the unemployment rate surpasses 9 percent (Katkus 2010).

Current global trends:

– It would be rational to discuss global trends more broadly and employ them in formulating crisis management model, strategies and tactics in the recommendations provided for Lithuania's policy-makers and social partners. Several world trends are presented below:

The closed circle tendency

– As expenses from the national budget are lowered, the income of the residents also decreases. Now people are inclined to save more. Thus this prompts the economy shrink, and the income into the national budget will again decrease, only now even more.
– Countries that do not curtail a growth in unemployment in time find themselves in a closed circle: it becomes necessary to pay out increasing sums for unemployment benefits to the jobless. Meanwhile, to have the necessary funds for this, it becomes necessary to raise taxes or borrow. Furthermore the person who is unemployed more than a half year loses many job skills and it becomes more difficult for such a person to find a job. It is extremely difficult to break out of this kind of closed circle and the clutches of unemployment. This may require as much as three to six years (Katkus 2010).
– Greater taxes push businesses into the shadow economy. In light of a shadow economy of such a scope, a closed circle forms of uncollected income for the national budget.

– Various changes in economic, social and financial processes (bankruptcies, unemployment, increasing bad bank loans, decreasing salaries and real estate prices and a downfall of various expectations) occurred rather suddenly during the crisis period. These changes are interrelated and they strengthen on another.
– Frequently a spiral process of the closed circle occurs in the life of a country. For example, real estate prices and consumer expectations rose rapidly due to the inexpensive loans during the time of a rising economy. The increasing value of real estate on the market formed conditions for the country's residents and organizations to receive additional loans, which were often used to invest in real estate again.

Economic and financial trends:

– The construction indicators (excepting employees since they pay taxes and the like) that are traditionally used for various reasons do not give a realistic picture of the situation in construction, its effectiveness and the quality of the work performed therein.
– Minimal debt is a very important safeguard and guarantee that the country's economy will be resistant to any sorts of crises.
– Lately countries have begun using the weakening of a currency as a means to cheapen export products in the world.
– It will only be possible to discuss the realistic effectiveness of crisis management, once the injections of financial incentives into the country's economy are stopped.
– The economy of the United States faced a low interest rate due to the huge inflows of capital from abroad, especially from Asian countries and due to the Federal Reserve's execution of interest rate policy that was not strict. The Asian countries, which had learned their lesson from the 1990 Asian crisis, wanted to artificially uphold currency rates at the export level and safeguard from the devaluation of their own currencies against the United States dollar. Thus they actively began to purchase stocks and bonds from the United States. The banking system was substantially reorganized. Generating new guarantees eased the huge inflows of capital from abroad (Brunnermeier 2008). Lithuania had landed in an analogical situation. Scandinavian banks offered truly favorable conditions to borrow for real estate development. The situation in Lithuania shows that pegging the national currency to the Euro caused a marked growth in the demand for real estate and loans due to the low interest rates. On its own accord, this influenced an even more rapid growth of the bubble in real estate prices.
– Reinhart and Rogoff (2008) studied a longer period of history and revealed an astonishing quantitative and qualitative analogy with the banking crises that had occurred earlier, during post-war years, among industrial

countries. The growth of margins and housing prices in the United States (which literature defines as the strongest and most essential indicator of a financial crisis characteristic of countries faced with huge capital inflows) correlates with earlier crises quite accurately.

– The expansions of real estate bubbles were similar in various countries. The increasing number of individual home ownership surpassed the natural size of the market. Most of the society believed that housing prices would never drop. The loan standards were overly unclear during the peak period of the bubble. These factors will also have a negative impact during the period following the crisis: the increased mistrust caused a drop in the number of people who wanted to keep their savings in a bank. The lower rate of financing by banks means it will be more difficult to obtain a loan/credit for purchasing a home and developing a business. The decreased investments will encourage slower growth in the future (Renaud 1997).

Qualitative trends:

– Differences in economic results can be explained by the different cultural, social and political environments, the mentality of the residents and their traditions and religions.
– People wishing to be more respected and recognized attempt to become successful investors and businesspeople even when they may not have knowledge, capabilities or funds to accomplish such. This encourages the appearance of a real estate bubble.
– The correlation between average salary and unemployment welfare also determines the scope of unemployment.
– Unfounded expectations on the part of a country's residents indirectly increase deficits in the national budget.
– Highly serious academic economists consistently defend the view that monetary policy means are unable to do much to combat bubbles. If the predominate expectations in the market are that some certain property will sharply increase in price, even an official, significant increase in interest rates might not affect the bubble. However, such an effort could negatively affect some sector in the economy irrelevant to the bubble. Financial markets are inclined towards bubbles, all on their own accord. Financial markets are inclined towards bubbles on their own accord (Kuodis 2008).
– The mortality rate of people relates strongly with economic crises – the mortality rate in Lithuania fell stably from the announcement of independence until 2000; after the Russian crisis, it leaped upwards again.
– The same as activity increases the life span of a person, 66 percent of organizations that had been under threat of demise survived for more than a decade more, because they changed and learned (Montuori 2000).

– How real estate buyers and sellers will behave during a crisis depends on various psychological factors.

Successful crisis management strategies in the branch of construction and real estate must be aligned with a specific country's economic, political, legal, technological, technical, organizational, managerial, institutional, social, cultural, ethical, psychological, educational and other situations as well as the situation regarding environmental protection and trustworthiness. However, it is not possible to copy even the best crisis management strategy, no matter how well it was applied in another country. Thus such a strategy for Lithuania must be modeled upon assessing its individual situation.

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IV. SUSTAINABLE REAL ESTATE DEVELOPMENT AND ASSESSMENT

Saulius RASLANAS, Andrius STASIUKYNAS

Real estate development is a multi-aspect business covering activities starting from the reconstruction and re-lease of existing buildings and ending up with the acquisition of undeveloped land and the sale of the built-up land. Typically, developers purchase a tract of land, determine the target market, develop the building program and design, obtain the necessary public approval and financing, build the structure, and lease, manage, and ultimately sell it.

Buildings have an ever-increasing impact on the environment (Chau *et al.*2010, Medineckienė *et al.* 2010). The attitude towards designing, construction and building management has been changing. Building classification and norms defining their planning, design, construction and management contribute to the regulation of the impact on the environmental.

One of the reasons of sustainable real estate development is urban sprawl that has become a major policy issue in recent years. It is often driven by uncontrolled development of suburbs at the edge of the city. Usually it leads to low density and loss of natural landscapes, and enhanced energy consumption. That is why in global terms sustainable real estate development is increasingly becoming a major challenge.

4.1. Concept of sustainable development

Sustainable development primarily invokes the concept of ecological sustainability, one which was presented in the World Conservation Strategy. The description of the sustainable development was first presented in the 1987 report of the special Commission on Environment and Development of the United Nations "Our Common Future" also known as Brundtland Report (WCED 2011). The concept of sustainable development outlined in this report – the development that meets the current needs of society, but also does not reduce the opportunities for future generations to meet their own needs. The main concept of sustainable development was adopted at the World Summit – the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. An outcome of the Conference in Rio de Janeiro – Agenda 21 was an action plan related to the implementation of the sustainable development and together was and a declaration setting out the main principles of sustainable development.

Bruntland Concept of Sustainable Development is described as a strategy or an instrument optimizing the relations between the society and the environment surrounding it, taking into consideration the social, economic and environmental goals of the society (Wilkinson, Reed 2007). The sustainable development has been validated as a major long-term ideology of society development. The base of the sustainable development consists of 3 equal components – environment protection, economic and social development. The sustainable development has three performance criteria to evaluate each goal along with three warnings:

1. The economic objectives should not be maximized breaching the environmental and social constraints.
2. The environmental benefits should not be maximized without complying with the economic and social constraints.
3. The social benefits should be maximized without complying with the economic and environmental constraints.

The sustainable development means maximizing the economic, social and environmental benefits, taking into consideration the limitations and restrictions. The main factors affecting the sustainable development are poverty, population, pollution, participation, market and political failures, prevention and disaster management. The sustainable development covers the development and environmental protection policy based on a comparison of costs and benefits and careful economic analysis, which strengthens the protection of the environment and sustainable prosperity (World Bank 2011).

The undeniable leader of the sustainable development is the European Union. The general provisions of the European Union for the sustainable development were officially formulated during the review of the programme of the policy and actions of the European Community in connection with the environment and sustainable development "Towards the Sustainable Development" performed and approved by the European Parliament and the European Council in 1998. The European Union Sustainable Development Strategy was approved in 2001 in Gothenburg (Sweden) during the Meeting of the European Council. It was stated there that the sustainable development is a long-term strategy of the European Union aimed to ensure a clean and healthy environment and better quality of life for the present and future generations. During the implementation of this strategy, it is necessary that the economic growth could accelerate social progress and improve the environment, whilst the social policies would promote economic growth and the environmental policy would be cost-effective. This strategy particularly focuses on separation of the economic growth from the use of resources and the impact on the environment, i.e. on the aim to achieve such a state when the economy is growing whilst the use of the natural resources and pollution of the environment are growing much more slowly than the economy or not growing at all.

The priorities of the renewed EU sustainable development strategy are as follows: climate change and clean energy production (i.e. the production of energy during which a small quantity of pollutants including those causing the green house effect is emitted in the environment), sustainable transport, sustainable consuming and production, protection and management of natural resources, public health, social inclusion, demography and migration, global poverty and challenges of sustainable development.

In 2002 the World Summit on Sustainable Development in Johannesburg admitted to the fact that the progress of sustainable development had not been speedy after the meeting in Rio de Janeiro; therefore all countries were asked to prepare their national sustainable development strategies in 2002 and to develop effective mechanisms for the implementation of these strategies.

The National Strategy for Sustainable Development of Lithuania was approved by the Government of the Republic of Lithuania on 11 September 2003 (National Strategy 2003). The main long-term, medium-and short-term objectives and tasks are listed in the Strategy, their implementation measures are also provided there. After the intensive creation of the national and international strategies for the sustainable development was launched, it has been noticed that in order to formulate reasonable tasks of the sustainable development, foresee the effective measures for their implementation and ensure their implementation it is necessary to have clear criteria of sustainable development (Čiegis, Ramanauskienė 2011; Sakalauskas 2010; Zavadskas, Turskis 2011). On 16 September 2009 the Government of the Republic of Lithuania amended and reformulated the National Strategy for Sustainable Development. The priorities and principles of the Lithuanian Strategy for Sustainable Development have been set out taking into consideration the national interests and identity of Lithuania as well as the priorities of the revised EU Strategy for Sustainable Development and provisions of other program documents. Its priorities are:

- moderate and sustainable industries and regional economic development,
- reduction of social and economic disparities between regions and within regions while retaining their identities;
- reduction of effects on the environment by the main economic sectors (transport, industry, energy, agriculture, housing and tourism);
- more efficient use of natural resources and waste management;
- reduction of risks to human health;
- mitigation of global climatic change and its impact;
- better protection of biodiversity;
- better protection of landscape and rational management;
- an increase of employment and decrease of unemployment, poverty and social exclusion;

- enhancement of the role of education and science, retention of Lithuanian cultural identity.

An average annual GDP growth rate of 5–6% would allow to reach the average 2003 EU Member States' level of economic development during the strategy implementation period (until 2020). A slow economic growth would not allow achieving of the basic objectives of sustainable development whilst a rapid economic growth would increase the risk of too fast pollution of the environment. However, during the last years the economic and social differences between regions in Lithuania not only decreased but even increased. Whilst due to the very poor thermal properties of the most of the blocks of flats and the distressed heating supply infrastructure the efficiency of the energy consumption for housing is 1.8 times lower in Lithuania than in the most of the EU states. Developing countries give priority to social and economic problems (Gibberd 2005), while Libovich says that developing countries, in order to ensure sustainable development, should not give priority to the environmental problems (Libovich 2005).

The basic idea of sustainability is that the current decisions should not affect the maintenance of the level of the living standards or the future prospects of their improvement. This means that the economy should be managed so that people could live from the dividends of their own resources. The "resources" cover the natural and other capacities, i.e. interest rate is regenerated by the natural or man-made environment. In order to maximize profits, developers analyze the results of market research before finding a plot of land. During the period of searching for and learning about the plot of land developers use all their knowledge to determine the results that are mostly financially attractive. The following factors may have an influence on the market supply and demand characteristics such as the rental charges, profitability and value of the capital:

1. It may be difficult to sell or lease larger buildings or plots of land as single units, for only large companies can afford them. If the demand is low and only a few companies compete for the property, the demand decreases together with the value.
2. Building accessibility is a key factor for its value. Rents and capital values may be higher if the building has better access.
3. Attributes of a building affect its value. Investors may give preference to newly constructed buildings because there are fewer risks in connection with them than with older buildings. Moreover, tenants give similar preference to the buildings that have more modern facilities, reduced operating costs or use energy more efficiently. The said factors help to increase the value of a building. The natural lighting and parking areas may also have an impact.

The sustainable economic growth means that the real GDP per capita increases over time and there is no threat of bio-physical (pollution, resource reduction) or social factors. The sustainable development:

- is a set of restrictions, which defines the rates of use of the resources not greater than the natural rates of their renewal.
- waste disposal rate should not exceed the Natural rate of absorption capacity of the ecosystem.

A sustainable approach also differs from a purely environmental when the nature and some of its resources cover and have an effect on the decisions in other areas (Figure 4.1). The early concept of sustainable development was characterized by strong environmental movement and the sustainability was often explained as economical utilisation of natural resources (Graham 2003). The aim is to maintain the flexibility and firmness of the biological and physical systems. The sustainable development talks about the essential ecological processes and life support systems, preservation of genetic diversity, and sustainable use of species and ecosystems. The main issues of sustainability of the environment cover the population, income, urbanization, health care, food, fish farming, agriculture, materials and energy, and these are just a few of them.

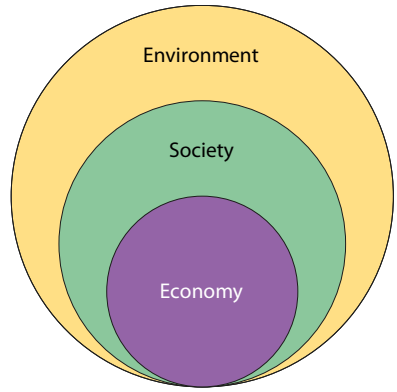

Figure 4.1. Environmental approach to sustainable development

The term “sustainable development” shows that the ecology lessons can and should be applied to the economic processes. Thus, the requirement to the development to seek to improve the quality of life (of all population) is challenging and should be checked. In accordance with the social and cultural approach the objective should be to maintain stability of social and cultural systems. The sustainable economic development is directly related to rising of living standards of the poor, which can be measured by increased food, real income, education, health care, water supply, and sanitation, and only indirectly related to the overall economic growth.

The three main factors, which are very important for the sustainable development, may be analysed separately. When performing the analysis of real estate development according to the principles of sustainability, it is seen that merging of these three aspects very is important for built-up environment. However, none of the major issues should be pushed away for the account of others. Thus, the well-known concept has been divided into three approaches to sustainable development. Elkington named this concept as the "triple bottom line" concept of sustainable development (Wilkinson, Reed 2007). This "triple bottom line" approach to the sustainable development aims to rationalize the economic development and growth, but also covers the importance of social welfare and promotes reducing of the impact on the environmental (Figure 4.2). In this manner sustainability consists of the following three elements:

1. Economics: salaries, income, labour productivity, creation of jobs, research and development costs, investments in training and other forms of human capital;
2. Environment: the effect of the processes, products and services on the air, water, land, biodiversity, human health, and
3. Social consequences: health and safety in the workplace, employee retention, rights, human rights, salaries and working conditions.

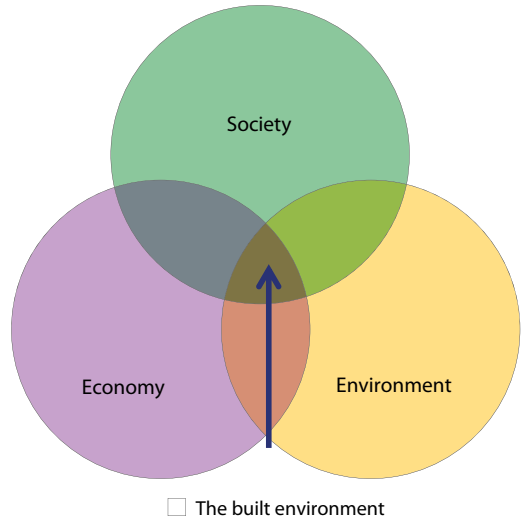

Figure 4.2. "Triple bottom line" concept of sustainable development (Wilkinson 2007)

These concerns differ from those of common private-sector development initiatives, which tend to focus primarily on monetary return on investment (Figure 4.3).

O'Riordan, Lutzkendorf and Lorenz developed an alternative "Three Pillars'" model which is based on the "Triple bottom line" concept (Lutzkendorf and Lorenz 2005, O'Riordan *et al.*2001). In this model sustainability is seen as an assimilation of economic activity, social welfare and integrity in terms of the environment (Figure 4.4.). This model is generally referred to as the "Russian doll" model. As it may be seen, the economic capital is the main basis for creation of well-being, which is promoted by the development, but it inhibits the social and environmental factors. During the planning of sustainable development of real estate it is necessary to take into consideration the environmental, economic and social aspects as equal and crucial (Blewit 2008).

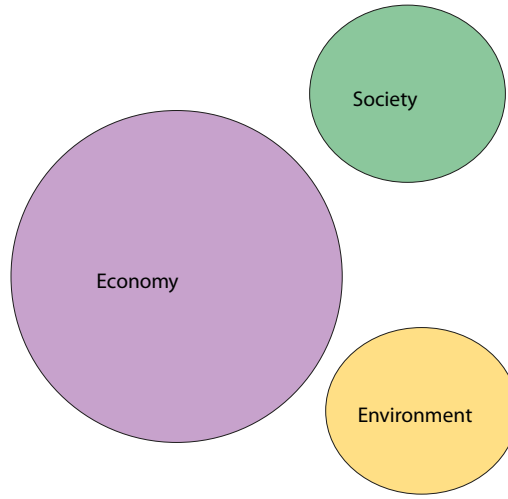

Figure 4.3. Private sector real estate development perspective (Wilkinson 2007)

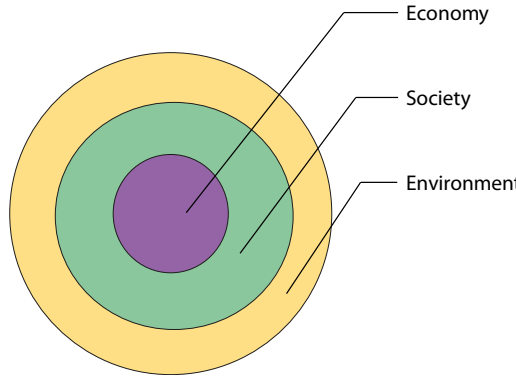

Figure 4.4. "Three pillars" or "Russian doll" model (O'Riordan *et al.*2001; Lutzkendorf 2005)

4.2. The principles of sustainable real estate development

Environmental, economic, and societal aspects must be equal underpinning elements in the planning of sustainable real estate development. Unsustainable is perhaps the best term that describes the lack of common sense that mostly characterizes contemporary real estate development. Present consumption of natural resources at the expense of future need is the hallmark of today's development environment. Global warming, depletion of non-renewable natural resources, and urban sprawl have become global challenges.

The Urban Heat Island (UHI) has become a global phenomenon as cities attempt to accommodate increasing demand for housing, commercial development, recreation space, and other uses which in turn increases the energy consumption of buildings, alters urban climatology, modifies urban wind patterns, and increases the concentration of air pollutants.

The 2007 Climate Change Report states that the information obtained from all continents and oceans shows that many natural systems are affected by regional climatic changes, particularly temperature increases (IPCC 2007). It is believed that nearly all regions of the world will be negatively affected by climate change, and this will trigger problems for most economic sectors. Some large-scale climate events have the potential to cause very large impacts:

- Reduced energy demand for heating;
- Increased demand for cooling;
- Declining air quality in cities;
- Reduced disruption to transport due to snow, ice;
- Effects on winter tourism;
- Reduction in quality of life for people in warm areas without appropriate housing;
- Disruption of settlements, commerce, transport and societies due to flooding;
- Pressures on urban and rural infrastructures.

It was important that 119 world leaders attended the UN summit in Copenhagen, the largest gathering of heads of state governments in the history of the UN. The 15th United Nations Climate Change Conference (COP15) took place in Copenhagen in 2009 December 7–18.

Greenhouse gas (GHG) emissions from industry, transportation and agriculture are very likely the main cause of recently observed global warming. Global GHG emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004 (IPCC 2007). The existing buildings stock in European countries consumes over 40% of final energy in the EU, of which residential use represents 63% of total energy consumption in the buildings sector (Balaras *et al.*2007). To reduce this share, the European

Commission has put forward a Directive on Energy Performance of Buildings, the EPB directive (2002/91/EC), which came into force 2002 and was implemented in the legislation of Member States in 2006. A building-related energy-saving measures reduce energy consumption and thereby GHG emissions significantly. If all retrofit measures covered by the EPB, and extended by adding all multi-family houses, non-residential buildings, and all single-family houses, were realized for all the European (EU15) building stock of 2002 at the same time, the overall CO_2 emission savings associated with heating the European building stock would amount to 398 Mt/a. As the building stock accounts for CO_2 emissions of 678 Mt/a, the savings correspond to a 60% reduction. In general, building-related energy-saving measures reduce energy consumption and thereby CO_2 emissions significantly. A lower level of energy consumption would, at the same time, reduce the vulnerability to rising energy prices and increase the reliability of its supply. A the same time, a number of environmental benefits would be obtained, and the energysaving efforts could moreover participate in promoting promising technological solutions as well as contributing to sustainable development.

Recent studies indicate that there is high agreement and much evidence of substantial economic potential for the mitigation of global GHG emissions over the coming decades that could offset the projected growth of global emissions or reduce emissions below current levels. Since the energy crisis in the 1970s and especially since the 1990s, when climate change and energy consumption became strongly linked, there has been a focus on energy savings in most Western European countries.

In Switzerland as well as in many other countries, the operation of buildings (heating, cooling, hot water generation, lighting) consumes about half of the total national energy supply (Amstalden *et al.*2007). Presently, the average global consumption of primary energy is 2100 W/capita. This figure varies between about 300 W/capita (e.g. in Bangladesh) and more than 10,000 W/capita (USA, Canada). It has been suggested that an industrialized country like Switzerland could cover all its needs with 2000 W/capita instead of its present 6000 W/capita. The paper explored the possibilities to reach two long-term targets regarding energy consumption and greenhouse gas emissions of the Swiss residential building stock:

– a reduction of the final energy consumption by a factor of 3 and
– of CO_2 emissions by a factor of 5 until 2050. The Federal Energy Research Commission has set as target 1 ton of CO_2 per capita.

A large potential for energy savings exists in the Danish residential building stock due to the fact that 75% of the buildings were constructed before 1979 when the first important demands for energy performance of building were introduced (Tommerup and Svendsen 2006). It is also a fact that many buildings

in Denmark face comprehensive renovations in the coming years and in connection with this renovation process energy saving measures can be implemented relatively inexpensive and cost effective. A profitable savings potential of energy used for space heating of about 80% is identified over 45 years (until 2050) within the residential building stock if the energy performances are upgraded when buildings are renovated.

The practice of sustainable development is closely linked to the conservation of natural resources. The built environment uses 40% of all extracted resources in most industrial countries and 30 to 40% of all generated energy (Miles *et al.*2007). Such practices cannot continue much longer without very serious consequences. The construction and occupancy of homes uses up resources and generates waste. Construction is responsible for 16% of the total solid waste production, and approximately 20% of this is from new homes. About 80% of this waste ends up in landfills, much of which can be avoided.

Environmental problems caused by consumption of energy are another challenge. One of the troubling facts is global warming, a result of greenhouse gas emission. Carbon dioxide, which is released by burning fossil fuels, is causing a gradual increase of the average air temperature at the earth's surface. Concerns about the unsustainable mode of harvesting non-renewable energy resources and the damage that their use is causing to the environment makes the use of renewable resources relevant as well as economical, considering die mounting costs of energy. The most recognized among the renewable energy sources are:

– Solar energy.
– Wind energy.
– Geothermal systems.
– Hydroelectric power.
– Biomass.
– Tidal energy.

Decades of poor planning, inconsiderate building practices, and overconsumption of goods have done little to reverse course in the built environment. Urban sprawl denotes landscapes with extensive areas of single family homes on large lots and commercial strips with large parking lots. Automobiles provide the only widely used means of transportation in these places. As it is commonly understood, sprawl involves the expansion of urban land uses out from a metropolitan core. The same process of metropolitan expansion that engulfs farmland on the metropolitan periphery also causes land abandonment in the metropolitan core.

Urban populations have grown significantly over the past two centuries, from 3% in 1800 to 14% in 1900 and 47% in 2000. Based on a United Nations estimate, 61% of world's population (up to 5 billion people) will live in urban areas by year 2030 (Frej, Peiser 2004). Changing demographic trends such as aging population, new immigrants and the influence of technology on the lifestyle

create a demand for absolutely new living environment and communities. In the second half of the 20th century, a great role was played by the migration of people from cities to their suburbs as well as by the decentralization of their housing and workplaces. According to the USA population census data, for every 3 inhabitants to the city centre there are 5 moving out of it. The traditional model of travelling from "suburbs to the city centre" has changed into the "suburbs to suburbs". In the future the population of cities will depend on young families and pensioners of early-age.

There are numerous studies on the future demographic development of European societies. Although they differ in detail they all come to the general conclusion that by the year 2050 the populations will age significantly, and considerably decline in numbers.

Mainstream developments are often regarded as a product, rather than a process, in which a range of aspects are being systematically explored and manipulated. The process, the key issues, and the relationships between them are illustrated with four general principles. The path of least negative impact is the sustainable path that a decision-maker of any planning endeavor needs to choose – a path that will result in the smallest negative impact on the environmental, societal, and economic factors of a project. The project's lifecycle can also be viewed as a self-sustaining process of resources and activities. It can be regarded that the energy used in the project's conception and building as a generator of additional sources to power its existence and even contribute to the creation of additional similar projects. Another keystone of a sustainable project is the relationship of its pivotal parts. When a supporting relationship is established, attributes of one component can propel activity in another. Influence among disciplines and effects of one on the others will in turn create a supporting system. The mark of good decision-making for a sustainable system is a project's ability to sustain itself throughout its entire lifecycle. A lifecycle approach sees the built environment subjected to an ongoing change and evolution. The process of a sustainable development needs to foresee the project's entire lifecycle.

The field of sustainability is very vast and the whole term cannot be covered by one definition (Ejdys, Matuszak-Flejszman 2010). Sustainable development in the context of a sustainable urban environment is perceived as such a construction, which creates the built-up environment through efficient use of resources and taking into consideration the environmental aspects (Friedman 2007; Kibert 2005). The efforts to move the concept of sustainable development from a theoretical level to a decision-making level and to link economic development to the environment involve a number of problems (Burinskiene, Rudzkiene 2009; Jakimavičius, Burinskienė 2009).

Sustainable development in construction involves understanding how the construction of buildings better meets human and environmental needs. Sustainability of construction is defined as a conflict between criteria. The challenge is to find an optimal solution based on such indicators. Multicriteria assessment methods are normally applied for resolving this issue (Šijanec Zavrl *et al.*2009; Mickaitytė *et al.*2008; Ginevičius *et al.*2008; Zavadskas *et al.*2008).

In 1993 the European Commission described the urban sustainability as a challenge in solving both the internal problems of cities and the problems caused by cities, recognizing that cities themselves provide many potential solutions (Faludi 2007). Municipal policy makers must seek to satisfy social and economic needs of urban residents considering natural systems on local, regional and global levels and to solve problems, when possible, on-site instead of transferring them elsewhere or leaving them for future generations. This idea gave birth to the concept of "elastic cities" defined as the employment of aggressive annexation strategies that result in more effective planning control over a city-region, higher population increases, stronger tax bases and healthier urban-regional economies than those of "non-elastic" cities (Meligrana 2007). There should be performed the multi-criteria analysis of the components of the sustainable development of cities together with the selection of the most effective cycle of life of the sustainable city development (Kaklauskas *et al.*2009).

A compact city was originally defined as a continuous urban area of a size that allowed optimal use of the existing services, employment and infrastructure. A compact city has two attributes:

- First is the physical compactness, which is the spatial configuration of land-use development within a city.
- Second is the functional compactness and the mix of daily activity. Questions as to what degree of compactness is conducive to sustainable urban development have yet to be answered.

Compact-city policies do not however offer a panacea for all urban problems. The idea that concentration reduces travel distances and promotes a shift of transportation preferences to non-motorized vehicles and public transport is open to debate. Most notably, a compact-city policy places the environment under certain strains such as the commotion of city life, noise, poor air quality, dust, toxic pollutants and a higher risk of disasters. This complex of effects is referred to as the "paradox of the compact city". These urban environmental conflicts facing compact-city areas require complex policy-making approaches.

The concept of smart growth or sustainable development, i.e. the quality growth is becoming increasingly commonplace for the development process. The principles of sustainability are applied during the designing, construction, utilisation or demolition of buildings. The sustainability shows a connection between the society and the specialists that create the environment. Whether the real

estate development that is being performed is sustainable is conditioned by how much attention is paid to reduction of consumption of the natural resources and the human created resources. This definition has drawn the universal interest as one of the ways to solve problems and continues influencing the development processes (Miles *et al.*2007). The smart growth is economically meaningful and environmentally friendly. It is a base for the conditions appropriate to live in and it increases the quality of life. And vice versa, when the mechanisms are controlled by rigid growth via the management strategies of the previous growth, the smart growth tries to contribute to the better quality during the development, promoting the economies by creation of new workplaces, earnings, tax revenues, raising the value of property, ensuring diversity of housing and transport alternatives, preserving or improving the environment, i.e. raising the quality of life. It is likely that smart growth will have a significant impact on future development via public pressure and politics.

The difficulties of the smart growth faced by developers are of two kinds. It is very important to encourage using the assessment tools at the very early stage, for basing on the determined objectives, it is possible to reject or at least reduce the occurrence of negative processes (Ali, Nsairat 2009). It is necessary to convince the public that the ways of development, especially in the peri-urban areas, should not be the same as they used to be, and prove that the smart growth is financially beneficial. At the same time, the public opposition is afraid of only the high-quality projects by which smart growth principles are implemented. The aim is to show people some examples of how it works, making the smart growth the rule rather than the exception. Both creditors and the public policy supported the development of the single family housing in the suburbs, whilst the development of the mix-use housing faced difficulties in the process of gaining permits. Changes in public opinion on suburban development are pushing the lending institutions, government representatives and developers to find a new way of promoting development of renovations and mixed-use development that is aimed for more than one purpose. Promoting mixed-use development is part of policies aimed at enhancing urban quality. Until recently, however, industry and housing have rarely been found together in the same development as there is a long tradition of keeping these functions separate. When workplaces, housing and commercial entities are close to each other, the public transport possibilities increase. The best way of reducing traffic congestion is to reduce the required travel distance and eliminate minor roads. Developers can contribute to the implementation of these necessary changes in development plans by offering dense, compact forms with mixed use, accessible by public transport. Sustainability experts stress that anyone – individuals, groups, governments, non-governmental organizations and large corporations can do it differently and encourage each other to do so. If every family used

only one car, it would reduce traffic congestion, emission of the gases causing the greenhouse effect and noise at the same time eliminating the inconveniences caused to cyclists and pedestrians.

Basically, the policy of sustainable development means the following:

- Development of the mixed-use becomes the norm.
- The priority is give to the public transport rather than to the personal.
- The diversity of the users of new development: owners and tenants, private and social housing.
- High quality projects both in the public sector and the sector of individual buildings.
- Promotion of the green buildings and treatment of contaminated land.
- Revitalization of the city economy, at the same time promoting living in cities.

The sustainable development tries to contribute to a better quality of growth when adjusted to the development promoting the economy by creation of workplaces, by earnings and tax revenues, increasing the value of property, providing with the diversity of housing and transport alternatives, preserving or improving the environment and increasing the quality of life.

Development of housing, offices, trading centres and entertainment centres in easy accessible places reduces the number of trips using the means of transport, expands the rush hour flows on the roads, makes transportation more cost effective and makes it possible for a larger part of people to live closer to their workplaces. Furthermore, mixed-use development usually makes the value of property bigger. The utilisation of the mixed-use development in the existing city locations or as a part of a new commercial centre of a city usually provides the commercial and dwelling units with a spectrum of sizes and choices. In terms of planning it could mean a combination of residential, commercial, industrial, office, public and other ways of using the land.

The policy of governments in respect to the real estate development has changed a lot recently. Usually, the most positive promotion is given to the development of brownfield, whilst green-field development is being rejected. Thus it is aimed to encourage urban renewal through “urban renaissance”. The conversion of older office buildings into residential premises (lofts) and construction of lots of residential buildings in central business district and around it - these are signs of the growing popularity of urban living. It is likely that in the future the sustainable development will have a significant impact on the development through public pressure and policy.

Planners should make a compromise between the environment protection problems that raise a serious concern for the largest part of the population (Mehaffey *et al.*2008). Analysing the changes of the environment protection and social and economic factors in accordance with two alternative scenarios of land

use development it has been established that the development of compact centres of a relatively high density improves the quality of land utilising a smaller amount of resources. Lee and Jou examined how politicians should choose the ceiling limits for built-up density and how the optimal policy is influenced by the main demand and technologies (Lee and Jou 2007). Landowners aim to develop property in a density which is higher than the socially optimal; however, the regulator can adjust it by setting the control of built-up density. The regulatory authority should make the developers build in a lower density (1) when development of the land becomes less risky (2), the development costs are expected to grow much faster, and (3) the rent of undeveloped land is lower.

Sustainable dense urban development should have the following characteristics:

- Provide adequate housing.
- Provide quality living space.
- Provide adequate open spaces with a healthy environment.
- Develop a centralized, self-contained urban city where the population is well served by public transport systems.
- Cultural vibrancy should be enhanced by the integration of old and new developments.
- To develop a dense city environment with adequate natural day lighting, air flow, vistas and an interesting cityscape, to give emphasis to a more "three-dimensional control" on development rather than heavily relying on prescriptive control on the plot ratio, site coverage and building height regulations. The "three-dimensional control" includes the evaluation of aesthetic, building form, facade treatment and height in relation to the surrounding environment.
- Respect the characteristics of a locality. For a particular small district, there should be an overall urban scheme with three-dimensional massing and possible options for carving out the development potential.

The construction industry is facing the challenge of increasing demands of its sustainability performance. Sustainability has become a very important factor in the design, constructing and managing buildings, recently. The real estate industry strongly believes that green building implementation is environment-friendly and can improve social values to the consumers. The selection of a location for greenhouses among alternative locations is a multi criteria decision-making problem including both quantitative and qualitative criteria (Akbiyikli *et al.*2012, Rezaeiniya *et al.*2012, Tam *et al.*2012). Green buildings have now become a flagship of sustainable development in this century that takes the responsibility for balancing long-term economic, environmental and social health. They have the following advantages: minimize energy consumption, waste, site impact, use of resources, environmental impact of building materials, maximize re-use of

existing buildings, quality of indoor environments and use of existing transport networks. Precisely, green buildings assessment, while applying effective rating systems, allows solve some problems of sustainable real estate development.

One of the instruments of ensuring sustainability in the real estate development could be the land value tax applied in accordance with real estate taxation (Raslanas *et al.* 2010 a, b).

4.3. Real estate taxation and sustainable development

For many years, taxes are the main source of revenue for every state for its vitality and implementation of its functions. In particular property taxation has the oldest history and, without it, many states, including Lithuania, would not be able to manage in today's world. Taxes are an essential component of national development. They not only facilitate social development but they are also the main source of national income. Real estate taxes are among the oldest types of taxes, and countries would not be able to exist without them today either. It is an excellent source of revenue for any municipality for cultural, educational, social and other public needs.

4.3.1. The Lithuanian system of real estate taxes

Currently the main real estate taxes in Lithuania are:

- Real estate tax.
- Land tax.
- The Republic of Lithuania's Land lease tax.
- Inherited property tax.

Within the Republic of Lithuania, a real estate tax is applicable to commercial use property such as hotel accommodations, administrative, trade, services, food services real estate etc. which belongs to individuals or legal persons. Whereas, real estate for residential, summer cottages, green-house gardening, auxiliary uses and other purposes as specified by law is only taxed when its use is for economical or individual purposes or when it is transferred to legal persons for use for an indefinite period or for a period exceeding one month (Lietuvos Respublikos nekilnojamojo turto mokesčio įstatymas 2005). From the beginning of January, 2012 all real estate is taxed; if real estate value exceeds 290.000 EUR it is taxed from 0.3% to 1%.

The tax rate was between 0.3% and 1% of the taxable value of real estate (average market value), according the mass evaluation procedure. Starting from January 1st, 2013 upper limit of the real estate tax rate increased to 3% instead of 1% and tax rates will be 0,3–3%. The assessment model used for this purpose is a mathematical formula for calculating the average market value of real estate in a particular real estate assessment zone in consideration of real estate

cadastral indicators. Real estate designated for residential, summer cottage and garage (except industrial) use is assessed according to comparative method. The taxable value of real estate can be established by performing an individual assessment of the real estate regardless of the case of assessment for which the assessment report had been prepared. Taxpayers may request the real estate tax assessor to consider the taxable value of the real estate established by its individual assessment as its value in the event the real property's average market value which was established by the mass real estate assessment differs from the real estate's value established by conducting the individual assessment by more than 10%. Meanwhile the taxable value of engineering structures and other types of real estate are established by the cost method.

Municipal councils establish the specific tax rate by the first of June of the current taxation period. Municipal councils may also establish several specific tax rates which are differentiated by one or several of the following criteria: use of the real estate, its technical maintenance condition, taxpayer category and the location within the municipality's territory.

The object of land tax is privately owned land and its owners are the taxpayers (Lietuvos Respublikos žemės mokesčio įstatymas 1992). The annual land tax rate was 1.5% of the land normative value. The base of the land tax is the value of the land assessed by the 1999 February 24 Government Resolution No. 205, "On Land Assessment Procedures". The basic value of a land site is determined by the scope of agricultural productivity calculated by taking the normative value of one hectare of agricultural land and multiplying it by the total parcel area and the correction coefficients that assess the territory's socio-industrial potential as well as an entire set of urban, ecological and land use aspects, limitations on agricultural activities and environmental pollution, an addendum on engineering structures and others.

Furthermore, new edition of the Law on the Land Tax was adopted by the Lithuanian Parliament and came into force since January 1st, 2013. The main idea of new amendments is to tax the land according to its market value, which shall be assessed for 5 years by the evaluation in a mass or individual way. The land tax rate limits are 0,01–4% and the particular rate shall be assessed by municipalities. In comparison, now the land tax rate is 1,5% from the normative value of the land. The difference is that according to the current law this value is not market value, but normative value, which usually does not correspond the real value and is much lower. The average market value of land which was established by a mass assessment in 2007 was about five times greater than the index-linked, nominal land value.

In most countries, the taxable value of land value tax is established on the basis of market value. A tax base grounded on market value is justified by an active real estate market in transition countries as well, where such property is

often bought for speculative purposes. A land tax base formulated in accordance with market value has a number of advantages:

- The public understands it.
- Social acceptability because owners of the more valuable land pay higher taxes and of less valuable land – lower taxes.
- Ease of control because taxpayers, when in doubt concerning the correctness of an assessment, are able to verify it by an individual assessment or by a comparing it with analogical properties.
- It better informs the public about the market.
- It prevents speculative transactions.
- It encourages market activity.
- It encourages efficient land use.
- It permits forecasts of future changes in the tax base.

Law on Leasing of Land of the Republic of Lithuania was ratified on 1993 December 23 (Lietuvos Respublikos žemės nuomos įstatymas 1994). The annual rate for leasing land was between 1.5% and 4% of the land's normative value. The Government approved a new land assessment procedure which came into force in 2013. Thus the rate for a lease is based on the average market value of the land. The average market value of land determined by mass assessment is about five times higher than the normative land value is. To buffer the impact on taxpayers, the lower limit on a land lease was changed from 1.5% to 0.1%; thereby municipalities will be able to set up any tax rate between 0.1% and 4%.

Inherited property taxes are paid by individuals. The tax object is the inherited property of a permanent resident of Lithuania (Lietuvos Respublikos paveldimo turto mokesčio įstatymas 2002). The tax object of a non-permanent resident of Lithuania is inherited movable property in cases when legal registration of such an item is required by the legal acts of the Republic of Lithuania. Such an item is (or must be) registered in Lithuania, the same as an immovable item that is located in the Republic of Lithuania. The tax base is the taxable value of inherited property calculated as established by the Government of the Republic of Lithuania. The tax is a percent of the average market value of the inherited property. The rates are:

- 5% when the taxable value of the inherited property does not exceed 145.000 EUR.
- 10% when the taxable value of the inherited property exceeds 145.000 EUR.

The analysis on the revenues of real estate taxes in Lithuania over a 17-year period leads to conclude that revenues of these taxis increased (Figure 4.5.). The revenue from the land tax within this period increased by 5.04 times, i.e., from 11,612 million LTL to 58,534 million LTL. The revenue from the real property tax also grew about 2.44 times during this period, i.e., from 108,829 million

LTL to 265 million LTL. However, the revenue from the RE tax was decreasing between 2002 and 2006 until a new type of real estate tax replaced the real estate tax on enterprises and organizations. This revenue decreased by some 6.9%. Replacement of this tax by the new type of real estate tax was not very effective, even though mass assessment was already being used to calculate average market values. Compared to 2005, the 2006 revenue from this tax only increased by 9.7% and, in 2007, it only increased by a few million from the previous year, totaling 236.574 million LTL. Although there were 7.6% more buildings and 7.6% more non-residential buildings registered in the Real Estate Register in 2007 compared to 2005, the revenue of real estate tax only increased by 12.4%. It is also common knowledge that real estate prices were rapidly growing in Lithuania and construction sector developing very fast. However, the revenues from taxes did not increase in proportion to the increasing values. Although the accuracy of assessments did improve once the mass assessment procedure was introduced, the right that the law provided to municipal councils to establish specific tax rates from 0.3% and 1% of the taxable value of real property or to grant complete tax exemptions and another reasons did not lead to the assurance of a constant and stable growth of tax revenues. There is also a real estate tax revenue decreased since 2010 from 298 million to 261.5 million in 2012, representing about 12%. Reasons worse collection remains the same, although real estate prices in recent years are stable but noticeable growing number of appeals to mass valuation.

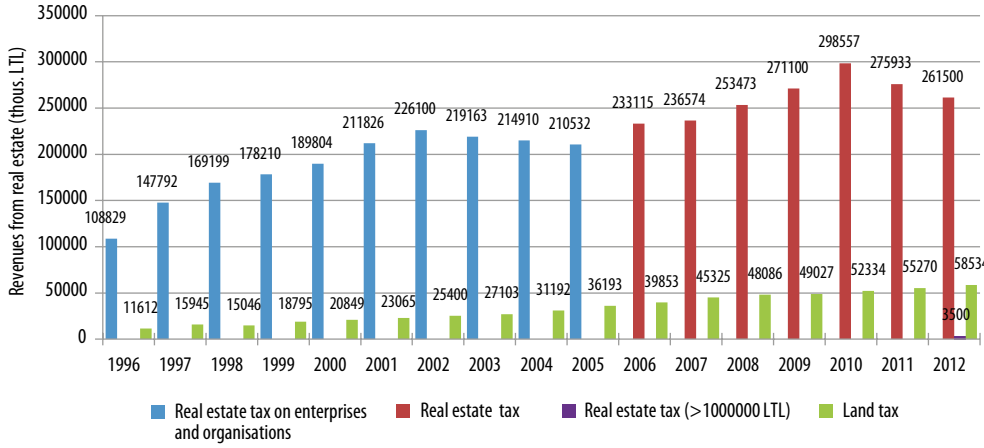

Figure 4.5. Revenues from real estate taxes in Lithuania in 1996–2012

The analysis shows that over the entire period the revenues of real estate taxes weren't stable (steadily increasing). Moreover, when taxes are levied on land and buildings, investment meets difficulties. The analysis of real property

taxes enables claiming that taxation of both land and buildings inhibits investment. Besides, the assessment of buildings that differ in their uses, condition, life cycle, etc. needs a lot of expenditures. Lithuania is developing country, so it should strive to attract as much investors as it is possible, i.e. to promote investment. However, the current real estate taxation system is not possible to allow such effect. The main idea of proposed land value tax (LVT) lays in the necessity to reject the link between land and building as well as levy a charge only on land value. In respect to it, was proposed a model for real estate taxation in Lithuania, based on a single LVT.

4.3.2. A new model for taxation system on real estate

A possible solution to the current real estate tax system is to have a single tax based on land value, applied across the board for real estate tax, land tax and the land lease tax. Some recommendations include:

1. Tax rates should guarantee the same revenues for municipalities as the current real estate taxes do. Therefore the tax rate is established as the ratio between revenues from the current real estate taxes and land values, as:

$$TR = (LTR + LLTR + RETR) / LMV, \quad (4.1)$$

where: TR is the tax rate; LTR is municipal revenue from the land tax; LLTR is municipal revenue from land leases; RETR is municipal revenue from the real estate tax and LMV is the total market value of all taxed land within the municipal territory.

2. Different tax rates need to be applied to avoid a high increase of taxes on residential land sites, opposed to a considerable decrease in taxes on commercial land sites.
3. The tax rate ceiling needs to be determined on a national level and municipalities need to be authorized to establish tax rates within established limits.
4. An untaxed minimum should be discarded, because it burdens the structure of the taxation system thus making it more expensive; it also negates human equality.
5. Exemptions from the land value tax can be granted to retired (age 65 years and older) and disabled (Categories 1 and 2) landowners but only until such land is bought or inherited.
6. If a tax more than doubles due to assessments of the land value tax, the increased tax can be distributed over a period of several (3–5) years.
7. Land should be reassessed annually to avoid huge value increases between assessments and to increase municipal tax revenues by taxing land value increases.

4.3.3. Effects of the land value tax

Land has a unique and substantial impact on the business system as a whole and on personal life as well. When considering humankind in general, land has significant value because it is the only place for all the nations and generations to live. Moreover land is a fundamental and natural factor in any area of business, taking a direct or indirect part in the production of all goods and services (Dietrich, Dietrich 1997). Land is different from other productive resources because it is immobile, and its content is constant. Land is a finite natural resource even though the resource may change over time and under management and use conditions. Land is there, not because it is produced but because it is natural. Of course the number of land parcels can vary depending on political decisions, planning provisions and owner needs. Nonetheless, land remains a finite resource. Land is also unique in that no two identical sites exist; therefore an appropriate labor and capital analysis does not apply to land.

Arising from human needs, economic activities have an impact on land resources by creating competition and conflicts and allowing non-optimal use of both land and land resources. In order to enable meeting future human requirements sustainably, it is important to resolve these conflicts now and move forward towards much more efficient use of land and its natural resources. However, to reach this, environmental, social and economic problems must be taken into account. The article by Jou and Lee (2008) deals with models of land value taxes and buildings taxes. Developed properties reduce open space, thereby harming urban residents, and landowners will develop properties sooner than is socially optimal. A regulator can correct this tendency by imposing a positive tax on development or a negative tax on land value. Alternatively a regulator can implement both instruments simultaneously in which case an increase in the tax rate on development will be accompanied by an increase in the tax rate on land value and vice versa. In 1995 Wisconsin (USA) changed its agricultural land assessment policy from market assessment to use-assessment. The result was a significant reduction in property tax burdens for agricultural landowners. The goal of this legislation was to protect Wisconsin's farm economy and curb urban sprawl by reducing the costs of retaining fringe land for agricultural purposes.

The analysis of real property taxes enables claiming that taxation of both land and buildings inhibits investment (Josten 2000). In addition the assessment for taxation purposes of buildings that have different purposes, conditions, ages and such demands considerable expenses. However, the main idea for having the land value tax is to eliminate the relation between land and building and to tax only the land.

The land value tax will be the most beneficial only when landowners pay it personally. When such taxes can be imposed on users or lessees or included in the price, the owners are not encouraged to make better and more efficient

use of the land. Transfer of the land tax occurs when a landowner (taxpayer) imposes the tax burden on a lessee who, in turn, must bear the tax burden, for example, by paying a higher rent. Then the land tax also becomes less effective. If a tax transfer is not possible, then the owner bears the tax burden. Potential buyers will calculate (capitalize) the tax into the price proposed for the land plot. Consequently the price will be higher. In a perfect case, a reduction of land plot value corresponds to the capitalized amount of land tax (Forster 2000).

Land value tax influences (Zavadskas *et al.*2005):

1. Territorial planning.
2. Use of land sites for construction.
3. Fiscal policy.
4. Land prices.
5. Urban development.
6. National economy.
7. Social aspect.
8. Environmental protection.

Municipalities lack funds for infrastructure costs in residential areas; thus they are not able to assign land for property development. The land value tax might improve funding for urban construction because it is due for payment from the moment of construction planning, regardless of construction progress. The land value tax might make planning more neutral. Introduction of the land value tax will be capitalized, and land prices will fall. This would lead to lower value increases that are determined by planning and lower profits for those owners who hold their land merely in expectation of increased future value brought by planning. Thus the impact of vested interests on territorial planning solutions would be limited, and planning would become more objective.

Land intended for construction very often stands unused or underused, because the expenses of uneconomical use are not obvious. In this case, the land value tax has a positive impact, because the steady payment of it establishes the expenses of incomplete land use. This is especially true in the case of owners who fail to use their land due to unawareness or other reasons. Land use would be improved, because the land value tax is based on land value as well as on possible income in some particular territory.

Unused land is often held merely as a capital investment. The land value tax might cause owners to change their behaviors because it reduces income from unused or underused land. Higher taxes would be imposed on empty land (without buildings) or underused land. Hence ownership of land merely expecting a future increase in its value would become less profitable. Additionally regular land reassessments would help to tax value increases as well (Lefmann, Larsen 2000).

Determination of land tax values, i.e., market values, is more accurate than any type of mass assessment of buildings. Moreover expenses related to the

calculation of land value tax would be considerably lower than they would be in case of the real property tax. Land tax has the important advantages of transparency and accountability. In particular, if land value increases due to governmental activities, there is a strong justification for recovering at least some of those costs by means of taxing the land component.

Urban land management is a fundamental matter of local public policy, and good land management should be fostered and supported as a core skill that a local government must have. This skill has great implications on all operations by the local government (Kaganova *et al.*2008). Kassahun (2006) has shown that differential land taxation (DLT) should be applied for sustainable land management where rural lands are subject to different taxation rates. Polyakov and Zhang (2008) analyzed the effect of property taxes on changes between agricultural, forestry, the Conservation Reserve Program and developed land uses in Louisiana and showed that land-use changes are inelastic with respect to property taxes.

The effects of a land value tax depend on the applied rate (Josten 2000). Higher rates provoke more reactions to the tax. The land value tax causes a greater supply of land sites intended for construction, because most owners try either to better use their underused land or to sell it. A tax system that imposes higher taxes on land puts pressure on owners to make more productive use of their land. If the tax system can create a built-in inducement, year in and year out, for better use of land, it will be an advantage. Such a mobilization effect will only remain while underused land is available or while new land sites are allocated for construction. This tax would have a greater effect on land demand in terms of pricing. Due to increased maintenance expenses, the land value tax should reduce the demand for land earmarked for construction. Then such a tax will increase land supply and reduce land demand; thus lower prices can be expected. Land prices will not start increasing only if municipalities continue allocating land sites for construction to satisfy the demand. However, if municipalities reduce the amount of land sites allocated for construction in reaction to the land value tax, the supply will decrease and the prices will start rising once again.

The land value tax helps to fight against land profiteering. Although it does not eradicate this problem, it does mitigate the situation. “Appropriation” of value growth partly defeats the main reason for profiteering, namely, the profits from rising prices. A land value tax will ensure that infrastructure costs will be attributed to their users thus supporting equitable urban planning. Long-term capital investment in land is no longer as attractive, because it would also reduce land speculation. The land value tax encourages landowners to use the possibilities legalized by territorial planning and to use their land with economic expedience and efficiency. Also, in such a way, land will be mobilized

for property development, and old industrial areas will inevitably be updated. The land value tax would impose a greater burden on empty land sites than the real property tax would. Therefore faster construction processes would be encouraged in newly allocated land sites for construction and in land sites that are empty as of yet.

Upon introduction of a land value tax, the maximum density and intensity of development would be established for each land site as currently being done. Increased use of a land tax poses significant problems. In particular an accurate assessment of land can be challenging, although statistical and econometric techniques may help address this in the future. A second concern is that more intensive use of land value taxation will lead to denser development, exacerbating many of the problems associated with congestion. These effects must be weighed against the positive benefits of reducing long-distance commuting. A third problem concerns equity. Owners whose property has a high land/improvement ratio will face an increased tax liability. Such a shift might be mitigated by adjustments to the tax rate, special exemptions or targeted tax credits.

The land value tax also contributes to the maintenance of buildings and reconstruction for obtaining potential gains over a long period of time. Of course it may happen that buildings which are very good in terms of construction but economically unprofitable could be demolished sooner than usual and new ones built.

Increased land use intensity as determined by a land value tax will reduce the demand for land sites for new construction. Growing rates of the real property tax actually cause an increase in the size of an urban area which, in turn, determines urban development. Thus replacement of the real property tax with the land value tax will slow down urban development (Brueckner 2001). In particular the demand for extensively used land will decrease. Owners of land sites in valuable urban locations who receive little income from their land will be encouraged to move to less valuable sites and may increase the demand for suburban land for property development.

The land value tax, in contrast to many other taxes, is not “imposed” on income and profit from private economic activities. On the contrary, buildings and investments remain untaxed. The land value tax also improves distribution of the production factor, i.e., the land. Thus investments are supported. Meanwhile the intensity of capital related to land use increases thus making a positive impact on the entire national economy. The land component of property value is a potential source of revenue for encouraging economic development (Chapman, Facer II 2005). Since the supply of land is fixed in the short run, an increase in a land tax will not affect the tax base. However, it will encourage more intensive use of the land and may slow urban sprawl. For example, Pittsburgh USA restructured the tax on land to be five times more than that on improvements in 1979–1980. Building activity showed a dramatic increase, although other

factors may have contributed to this change as well. Pittsburgh later returned to a single-rate property tax system.

The land value tax, as said, pledges an increased land supply and reduced demand making it easier to buy property. Investors who appear in the land market after introduction of land tax will practically not notice the tax when buying a lot of land, because the prices on lots of land prices will not rise. The land value tax will reduce the tax burden on effectively used sites. Moreover, even in the event that the burden of the tax on a lot of land does increase, rental prices will not rise by much. Therefore the lessees will not suffer the tax burden. The tax burden will fall on the leaser, because the lessee will not be prepared to pay a rent increase due to the tax.

The land value tax supports intensive land use as well as environmental endeavors to reduce residential land use. Extensive use of land for residential and business purposes will become more expensive. However, Korthals Altes (2009) proposes taxes on building in green spaces which may be an instrument for balancing urban growth and the protecting the landscape. This article discusses a development tax in the context of other planning instruments. An article by Geoghegan (2002) finds that the preservation of open spaces has become an important policy topic in many regions of the USA. One tool of such a policy along with Cluster Zoning and transferable development rights are land taxes to fund purchases of remaining open spaces. Numerous communities in the United States have been willing to use public funds to protect open spaces (Nelson *et al.*2007). Factors that increased the probability of a municipality holding an open space referendum from 2000 to 2004 were a large population, low population density, rapid growth in the surrounding areas and highly educated and environmentally-concerned residents.

The land tax will make it economically expedient to reduce areas of used land, for example, by construction of higher buildings. It will help to preserve nature and landscapes. Denser construction would reduce use of roads and energy. This factor is especially important in the face of threatening climate change. The 2007 Climate Change Report states that the information obtained from all continents and oceans shows that many natural systems are affected by regional climatic changes, particularly temperature increases (IPCC 2007). It is believed that nearly all regions of the world will be negatively affected by climate change, and this will trigger problems for most economic sectors. It was important that 119 world leaders attended the UN summit in Copenhagen, the largest gathering of heads of state governments in the history of the UN. The 15th United Nations Climate Change Conference (COP15) took place in Copenhagen in 2009 December 7–18.

The gases causing the greenhouse effect (GHG) are emissions from industry, transportation and agricultural production and they are a major cause of the

global warming that is observed currently. In European countries, buildings consume over 40% of the EU's total energy, whereas residential buildings consume about 63% (Balaras *et al.*2007). Energy-saving measures significantly reduce energy consumption and thus GHG emissions. Recent studies show that there is a great economic potential in the coming decades to reduce GHG emissions globally. The land value tax would contribute to resolving the climate change problem.

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4.4. An assessment of sustainable buildings

Chaotic urban development, saving of natural resources and energy as well as climate change are the main reasons for the sustainable real estate development. Therefore the multi-criteria analysis of the components of sustainable urban development should be carried out. According to Choguill (2008), no city will be sustainable if the component parts thereof are not sustainable. Therefore it is important to start with buildings. A lot of research have been carried out, buildings have been applied various assessment methods, especially aimed at solution of energy and other resources consumption recently. Building sustainability assessment becomes one of the main problems of sustainable construction.

4.4.1. The review of building sustainability assessment systems

Building sustainability covers different relationships of the built-up, natural and social systems. Therefore it comprises a set of priorities to be taken into consideration at each stage of a building life cycle. There are about 600 assessment systems measuring social, environmental and economical indicators of sustainability. The main existing building sustainability assessment systems (SAS) allowing their use and application in another countries are BREEAM, LEED and DGNB (see Table 4.1).

The main international organization bringing together the largest and most common sustainable building rating systems is the Green Building Council, which was established in 1999; at present it unites more than 30 separate systems tailored to different countries (WorldGBC 2011). The GBC do not advertise any particular sustainability assessment models. Their aim is to help and promote the emergence of new or adapted methods of assessment in particular countries. Developing sustainable /green building market, the GBC expects that the "green and cost-effective houses" will become a part of a comprehensive strategy aimed to reducing of CO_2 emissions.

Table 4.1. Sustainable building assessment systems

Name of system	Year of creation, country
BREEAM (Building Research Establishment Environmental Assessment Method)	1990, UK
LEED (The Leadership in Energy and Environment Design)	1998, USA
HK-BEAM (Hong Kong building environmental assessment method)	1996, Hong-Kong
GBTool (Green building challenge)	1995, International
CASBEE (Comprehensive assessment system for building environmental efficiency)	2004, Japan
BEPAC (Building environmental performance assessment criteria)	1993, Canada
DGNB (German Sustainable Building Council)	2007, Germany
LiderA	2000/2005, Portugal
Green Star	2003, Australia
HQE (High Quality Environmental standard)	1992, France
Minergie	1994/1997, Switzerland
TQB	2002, Austria
CEPAS (The Comprehensive Environmental Performance Assessment Scheme for Buildings)	2001, Hong-Kong
BCA Green Mark	2005, Singapore
TERI GRIHA	2007, India
Protocollo ITACA (Innovation and Transparency of the Contracts and Environmental Compatibility)	2005, Italy

The United Kingdom is the first country which started assessing building sustainability. Other countries followed its example. However, British BREEAM system is still one of the main systems of certification of sustainable buildings (BREEAM 2011). The BREEAM has changed a lot – from a 19-page report with 27 possible points to the 400-page technical guidelines (an edition intended for newly constructed buildings) with 132 points. The BREEAM system provides its customers, developers, designers and others with the following opportunities (Dalal-Clayton and Bass 2002):

– to recognise for the market the building with low environmental impact;
– to ensure that a building is installed with the best environment protection systems;
– provides innovative solutions on decreasing the impact of the environment;
– to provide guidance on how to reduce operating costs, improve working and living environment;
– to present a standard that reflects the progress of the objects of general and environmental organizations.

The BREEAM system covers a wide range of environmental and sustainability issues and provides developers and designers with a clear proof of whether a building complies with building a sustainable level or not. The system employs a clear points system that is easily understood and has been prepared in accordance with the actual examples of best practice. The BREEAM has a positive impact on the design, construction and management of buildings. For that purpose, clear technical standards, which are accurately examined and assessed by professional evaluators, have been established and adopted. It is very important that the assessment is carried out at a very early stage of the design, for it is possible to avoid or at least reduce the occurrence of negative processes based on the set objectives. The BREEAM system assesses buildings by the number of the % gained. There are five categories:

1. Pass – at least 30%.
2. Good – 45%.
3. Very Good – 55%.
4. Excellent – 70%.
5. Outstanding – over 80%.

Currently, more than a million of buildings worldwide have been assessed using the BREEAM system. More than 200 000 of those buildings have already been given certificates of some certain level. After a building has been assigned to a certain type, it is assessed in accordance with the following 10 criteria (BREEAM schemes 2011):

1. Management.
2. Waste.
3. Health and wellbeing.
4. Pollution.
5. Energy.
6. Use of the land and environment.
7. Transport.
8. Materials.
9. Water.
10. Innovations.

The BREEAM system is widely used in the UK. All state institutions must be assessed under BREEAM. Majority of local authorities require BREEAM assessment for approval of larger projects developed.

The LEED system created in the USA in 1998 has also been widely used and is the Green Building Assessment System recognised worldwide (LEED 2011). In order to establish and evaluate environmental friendliness, the LEED system, as well as the BREEAM, examines the sustainability of a building in terms of the whole of aspects important for human health and environment. This assessment system may also be used on any stage of the building life cycle. The LEED

promotes a sustainable approach to the buildings in the following key areas: Sustainable Sites; Water Efficiency; Energy and Atmosphere; Materials & Resources; Indoor Environmental Quality; Innovation in Operations; Regional Priority.

The fields of assessment of these two systems are similar and so is their evaluation system: each of the assessed fields is given a certain number of credits (points) which are assigned depending on how much the assessed building complies with the criteria of that field. Summing up the number of credits (points) gathered in all fields gives the total result which is compared with the assessment scale in order to assess (certify) the building: in accordance with the LEED: Certified; Silver; Gold; Platinum.

These two systems are well advanced, applied in a number of countries worldwide; the majority of methods and systems that emerged later are based upon them (Ding 2008). BREEAM has influenced virtually all environmental impact assessment systems (Mao *et al.*2009). Many countries have adopted the BREEAM system to their own needs which led to occurence of new systems such as HKBEAM (Hong Kong), BEPAC (Canada) and GreenStar, Basix in Australia. SAS cover different stages of the life cycle of a building and assess the environment protection aspects differently, however, they have some specific common elements: the greatest attention is paid at a building, building sustainability is mostly assessed in terms of environment protection, it is considered that a building is sustainable when it has been constructed or renovated and operates in an environment oriented manner reducing its impact on the environment, whilst the contribution of buildings to the sustainable development is assessed based upon the properties of a building. SAS assess sustainability of a building without giving proper consideration to the complex social, economic and environmental functioning of a built-up area. Nevertheless, the similarities and differences of the classified systems may be assessed, and such information may be used for their improvement (Haapio, Viitaniemi 2008). The directions of improvement of SAS such as comparison of various solutions and optimisation thereof and recommendation of a better solution in terms of sustainability have become popular in the field of scientific research. Transformation of the existing building environment assessment system into the assessment of sustainability is becoming a more and more relevant subject while the future requirements grow.

Most systems do not cover social, economic and institutional sustainability aspects, the significances of criteria, giving credits and final assessment are ambiguous and have drawbacks. Although systems focus on different things, all of them tend to the resources and environment criteria associated with saving of water and energy resources. Along with that, they dominate over the social and economic problems. Thus, scope of sustainability lack the balance between different sustainability dimensions; the environment protection attitude, technological problems and certification prevail here. BREEAM, BEPAC, LEED and

HK-Beam do not assess the financial aspects which is contrary to the final principle of real estate development such as the financial return. A project may remain unimplemented as it is less economically attractive to a developer despite the fact that it is environmentally friendly. On the other hand, financial returns are often the only concern for the implementation of a project, however, a project that demonstrates the best financial return is not necessarily the best choice for the environment.

Inflexibility, complexity, drawback of a system, and absence of the building life cycle cost (LCC) analysis are namely the major deficiencies of systems (Cole 2005). Furthermore, the current second-generation SAS, e.g. DGNB, assess the building life cycle costs but inflexibility and complexity are still characteristic of the most of SAS. According to Haapio and Viitaniemi (2008), when assessing sustainability of a building, along with the aspect of environment protection one should analyse and include into the assessment the economical and social aspects as well. Environmental issues and financial provisions should go hand in hand. This is especially important at the stage of financial substantiation when alternative development options are being evaluated. To assess the sustainability of the building and meet the needs of all users is not an easy task. Thus, the assessment should include the requirements of all stakeholders involved in the development.

Most of building environment assessment systems used in different countries of the world are very similar and are based upon the BREEAM or LEED model, with local amendments introduced due to specific environment conditions, construction norms or standards. After the analysis of various SAS, it may be argued that the BREEAM system is flexible, quite simple and has been applied in a number of countries (Netherlands, Spain, Sweden, etc. (BREEAM schemes 2011).

Due to constantly increasing impact of buildings on the environment their classification, standards determining their planning, design, construction and management contribute to the regulation of sustainable development. Sustainable real estate development is inseparable from the construction of recreational complexes. Lithuanian classifiers and classifiers of some foreign countries do not cover water and winter entertainment centres. Therefore it is necessary to supplement and unify building classifiers internationally.

There are a lot of SAS created in the world which are used for assessment of one or another aspect of sustainable building development – environmental, economical or social. However, there are not many systems that cover all components as equally significant. Most of the systems do not sufficiently cover the social, economical and institutional aspects of sustainability; the criteria significances, assignment of credits and final assessment are ambiguous and have drawbacks.

In order to insure sustainable real estate development not only environmental problems should be given a priority, but the environment protection, social and

economical aspects should be considered as equally significant. Transformation of a SAS with a strong focus on the assessment of building environment into the assessment of sustainability is becoming a relevant subject.

4.4.2. The recreational complex real estate sustainability assessment model and system

Almost all of the environmental assessment methods have been developed for a specific territory, however, they have not been fully adapted to all regions (Alyami, Rezgui 2012). Each region has its own geographical, cultural features and resources. Therefore currently there are a lot of assessment systems, and even more are being developed. Some countries use innovative systems nationally interpreting them while other create their own ones. When creating a building SAS, it is necessary to have a sustainability assessment model, which will be determined after the analysis of the BREEAM. The general scheme of methodology of creation of the recreational complex sustainability assessment model is provided in Figure 4.6.

The analysis of the BREEAM has been carried out by a group of 8 experts: 6 experts were selected from the Druskininkai Snow Arena developers' group and 2 from the employees of the city municipality who were involved in the implementation of this project. In order to ascertain how the environmental, social and economic sustainability aspects had been assessed according to the criteria, the breakdown method was used, in accordance with which the possible credits of each criterion were assigned to one or several principles of sustainability (environment, social and economical), dividing the credits at a 0.5 interval (Raslanas *et al.*2013). Having evaluated the mean significance of possible credits of all criteria within the system, we found that the significance of sustainability principles of the criteria of the assessment model was: 66.96% – environmental, 22.52% – social and 10.52% – economical aspects (Table 4.2).

The significances of the three main principles of sustainability assessment of recreational complexes real estate (RE) should be similar or equally significant. In order to equalise their significance and assess them as uniformly as possible, we used the compensation method in two stages:

1. The significance of economical part – 0.1052 – was increased, of the environmental part – 0.6695 – decreased, and of social part – 0,2253 – left the same (Table 4.3.).
2. New social and economical criteria even more balancing the significances of three sustainability principles were introduced.

Having balanced at the 1st stage the significances of the environmental, social and economical criteria, we acquired their total significance of 0.7705. Taking into consideration the deficiencies of the analysed models, i.e. insufficient coverage of the economic and social aspects, the assessment model is supplemented

by additional criteria whose significance will be 1.00 – 0.7705 = 0.2295; then the total of significances of all criteria will be 1.00.

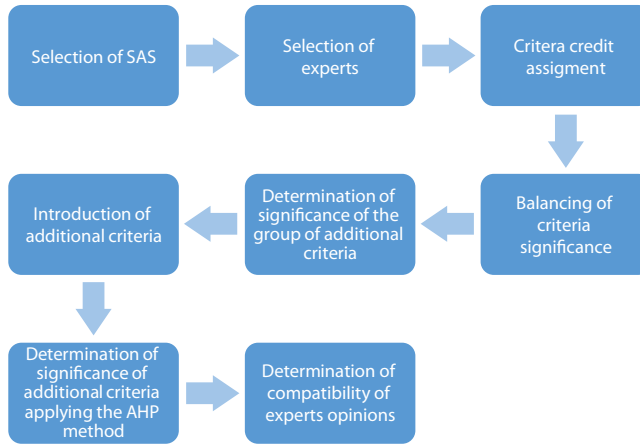

Figure 4.6. Scheme of proposed methodology of creation recreational complexes real estate sustainability assessment model

Table 4.2. Decomposition sustainability credits using breakdown technique

Criterion/marking	Possible credits	Assignment of credits			Significance of a criterion within the system		
		Econo-mical	Social	Environ-mental	Eco-nomical	Social	Environ-mental
Monitoring of imple-menting of project solutions/ Management 1	8	1	2	5	0.0057	0.0114	0.0286
Construction site work supervision/ Management 2	2	0.5	–	1.5	0.0029	–	0.0086
Environmental im-pact of construction/ Management 3	5	1	1	3	0.0057	0.0057	0.0171
Participation of intermediaries/ Management 4	4	1	3	–	0.0057	0.0171	0.0000
Building life cycle cost/Management 5	2	2	–	–	0.0114	0.0000	0.0000
Other groups of criteria	…	…	…	…	…	…	…
Total result	132	18.5	28	85.5	0.1052	0.2253	0.6695

Table 4.3. Balance of criteria significances

Criterion /Code	Criteria significances			Balanced criteria significances			
	Econo-mical	Social	Enviro-nmental	Econo-mical	Social	Envi-ron-mental	Recalcu-lated signifi-cance
Monitoring of imple-menting of project solutions/ Management 1	0.0057	0.0114	0.0286	0.0114	0.0114	0.0143	0.0371
Construction site work supervision/ Management 2	0.0029	0.0000	0.0086	0.0057	0.0000	0.0043	0.0100
Environmental im-pact of construction/ Management 3	0.0057	0.0057	0.0171	0.0114	0.0057	0.0086	0.0257
Participation of intermediaries/ Management 4	0.0057	0.0171	0.0000	0.0114	0.0171	0.0000	0.0286
Building life cycle cost/Management 5	0.0114	0.0000	0.0000	0.0229	0.0000	0.0000	0.0229
Total of significances in the group	0.0314	0.0342	0.0543	0.0628	0.0342	0.0272	0.1243
Other groups of criteria	…	…	…	…	…	…	…
Total significance	0.1052	0.2253	0.6695	0.2104	0.2253	0.3348	0.7705

Having performed the breakdown of the assessment criteria credits and balancing of the significances, and having introduced a group of additional criteria, we obtained the criteria groups significances (Table 4.4).

In order to ensure efficient building sustainability assessment method, appropriate criteria should be identified, and since they are multidimensional, appropriate significance should be determined for each of them. Taking into consideration the aforesaid, the experts proposed to supplement the system used in Lithuania for assessment of recreational and other buildings with social and economical criteria. The social principle of sustainable development is supplemented with the following criteria:

1. Project examination by independent experts.
2. Cooperation between the private and public sectors.

3. Increasing the employment of local residents.
4. Application of standards of the quality management and social responsibility guidelines.
5. The importance of the building in the area (increase of functional promiscuity, i.e. it is assessed whether the constructed object is necessary for the locals and the region).
6. Improvement of the quality of life.

Table 4.4. Criteria groups of recreational complexes and their weights

Criteria groups	Significance, %
Management	12.43
Health and welfare	13.00
Energy	15.07
Transport	6.80
Water	6.00
Materials	6.25
Waste	4.38
Use of land and environment	6.00
Pollution	7.12
Additional criteria (social + economical)	22.95
Total	100
Innovations	10.00

Recreational facilities can operate successfully only if they are economically feasible. Therefore the economical principle of sustainable development is supplemented with the following criteria: 1) payback; 2) EU support; 3) economic benefit of the region (e.g. increase of the tourist flow).

After selection of additional criteria, there is a problem of how to determine their significances. For that purpose Alyami and Rezgui (2012) recommend application of the AHP method, which was proposed by T. Saaty (1980). The sustainability assessment models are mostly criticised for the criteria significances, for their different value and importance are hard to assess and compare. Apart from weighting coefficients, the models are criticised because of the lack of scientific proof in respect to the priorities (Ding 2008). Thus, the determination of criteria significance is the base of all SAS, for they condition the overall result of an assessment. The AHP method simply structures the problem using the principle of hierarchy which is based on the pairwise comparison matrix (Al-Harbi 2001; Podvezko 2009).

Table 4.5. 8 expert criteria weights by AHP pairwise comparison questionnaires

Experts	1	2	3	4	5	6	7	8	Average signifi-cance
Project examination by independent experts	0.0183	0.0132	0.0137	0.0127	0.0145	0.0152	0.0146	0.0155	0.01472
Cooperation between the private and public sectors	0.0350	0.0747	0.0571	0.0686	0.0405	0.0609	0.0721	0.1003	0.06367
Increasing the employment of local residents	0.1075	0.2148	0.1615	0.1188	0.1806	0.1343	0.2899	0.2436	0.18138
Application of standards of the quality management and social responsibility guidelines	0.0247	0.0196	0.0223	0.0318	0.0224	0.0235	0.0340	0.0244	0.02534
Increase of functional promiscuity	0.0507	0.0385	0.0344	0.0217	0.0327	0.0296	0.0216	0.0346	0.032970
Improvement of the quality of life	0.2223	0.1744	0.2740	0.1521	0.1207	0.2345	0.1094	0.0817	0.171137
Payback	0.3121	0.3350	0.2576	0.2953	0.3453	0.3468	0.1656	0.1481	0.275736
EU support	0.0739	0.0314	0.0777	0.0812	0.0671	0.0464	0.0425	0.0530	0.05915
Economic benefit of the region	0.1555	0.0984	0.1018	0.2177	0.1762	0.1087	0.2502	0.2987	0.175898
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	100

In order to determine the significances of additional criteria there have been created questionnaires in which the experts compared them in pairs using a 9-point system. Each expert made a pairwise comparison matrix which also contains a criteria significance determined using the AHP method. The criteria significances obtained based on the Saaty method using the pairwise criteria comparison questionnaires of 8 experts are presented in Table 4.5. 6 experts gave priority to the payback (the significance ranged from 0.257 to 0.347), and then to the increase of the employment of local residents (from 0.134 to 0.215). The other two experts considered the key priority the economic benefit of the region (significance – 0.250 and 0.299). It is also noteworthy that all 8 experts unanimously gave the lowest priority to the independent expert's opinion during the constructional design (significance – from 0.0127 to 0.0183).

The consistency of assessments of each separate expert is also checked using the AHP method. The determined significances make sense if they have been derived from consistent matrixes or almost consistent matrixes. Therefore the consistency should be determined. For that purpose Satty (1980) proposed the consistency index *CI* associated with the eigenvalue method.

$$CI = (\lambda_{\max} - n)/(n - 1), \tag{4.2}$$

where λ_{max} = maximum eigenvalue.

The consistency index *CR* calculated in accordance with the formula:

$$CR = CI/RI, \tag{4.3}$$

where *RI* is a random index. If *CR* is less than 10%, the matrix may be considered as having an acceptable consistency. The consistency of each separate expert's assessment has been determined and the consistency of each matrix has been verified based on that. In the course of analysis there have separately been determined the consistencies of the 8 experts' opinions. The level of consistency of all experts was acceptable because their consistency indices CR_i were less than 0.1 where the number of criteria $n = 9$ and the random index $RI = 1.45$.

When expert assessment methods are applied, the experts' opinions presented are usually different and may even be controversial. Therefore, prior to making a decision, it is necessary to assess the compatibility of experts' opinions (Ginevičius and Podvezko 2007). If the number of experts exceeds 2, the level of compatibility of the experts' group is determined in accordance with the coefficient of concordance W (Kendall 1990). The consistency of all group of experts is determined in accordance with the coefficient of concordance by calculating the significances of each separate expert's criteria (in our case, by applying the AHP method) and by ranking thereof, i.e. the most important index is assigned the 1st rank, the second in order of importance – the 2nd rank, etc., and the

last – the *n*-rank. Thus, the reliability of the expert opinion is expressed by the coefficient of concordance, which determines the level of similarity of separate opinions:

$$\overline{W} = \frac{12S}{r^2(n^3 - n)}, \tag{4.4}$$

where S – the squared total of deviation of each criterion value, r – number of experts, n – number of criteria. The coefficient of concordance is applicable in the research if it threshold value has been determined, that is when the experts' assessments still may be deemed compatible. When the number of criteria $n > 7$, the significance of the coefficient of concordance may be determined in accordance with χ^2 criteria:

$$\chi^2 = \frac{12S}{rn\ (n+1)}. \tag{4.5}$$

According to the selected level of significance α (usually 0.05 or 0.01), the threshold value $\chi^2{}_\alpha$ is derived from χ^2 table of distribution with the degree of freedom $\nu = n - 1$. If the obtained value of χ^2 is greater than $\chi^2{}_\alpha$, the experts' assessments are compatible. If $\chi^2 < \chi^2{}_\alpha$, it is considered that the experts' opinions are incompatible.

Then the consistency of the whole group of 8 experts is determined using the coefficient of concordance $\overline{W}$, having first calculated the criteria significance of each separate expert using the AHP method. The ranking procedure is performed on the basis of decrease of criteria significance. The coefficient of concordance, calculated according to the formula 4.4 without assessing the related ranks, $\overline{W}$ = (12*3440)/(8*8*9(9*9–1)) = 0.896, and the value of χ^2, calculated according to the formula 4.5, χ^2 = (12*3440)/(8*9*(9 + 1)) = 57.33 is much greater than the threshold $\chi^2 > \chi^2{}_\alpha$ = 20.090, taken from the table of distribution $\chi^2{}_\alpha$ with the degree of freedom ν = 9 – 1 = 8 and level of significance α = 0.01. From this it follows that the experts' opinions are compatible. Finally, by the significances of additional criteria we will apply the average experts' significances determined using the AHP method, which are presented in Table 4.6.

The recreational complex RE sustainability assessment model is based upon the Simple Additive Weighting method (SAW) which allows assessment of indices with different dimensions. This is one of the simplest and most widely used methods of multi-criteria assessment (Podvezko 2011). The base of the SAW – integration of the criteria values and significances into a single estimate S_j when the value of each normalised criterion is multiplied by its significance and aggregated with other members.

Table 4.6. Additional criteria significances

Criteria	ω_g, %	ω_s
Project examination by independent experts	1.5	0.0034
Cooperation between the private and public sectors	6.4	0.0146
Increasing the employment of local residents	18.1	0.0416
Standards of the quality management and social responsibility	2.5	0.0058
Increase of functional promiscuity	3.3	0.0076
Improvement of the quality of life	17.1	0.0393
Payback	27.6	0.0633
EU support	5.9	0.0136
Economic benefit of the region	17.6	0.0404
Total amount	100	0.2295

$$S_{ij} = \sum_{i=1}^{n} \omega_{ij} \bar{\gamma}_{ij}, \tag{4.6}$$

where S_{ij} is the weighted sum of normalised values of criteria, ω_{ij} – j significance of the i-criterion of the group of criteria, $\bar{\gamma}_{ij}$ – normalised value of the i-criterion of the j criteria group. The normalisation is performed for the criterion of the j group by division of the number of credits assigned to the i criterion by the maximum possible number of credits assigned to that criterion:

$$\bar{\gamma}_{ij} = \frac{\gamma_{ij}}{\max \gamma_{ij}}, \tag{4.7}$$

where γ_{ij} – the number of credits assigned to the i criterion of the j criteria group, max γ_{ij} – the maximum possible number of credits of the i criterion of the j criteria group. The significance ω_{ij} of the i criterion of the j criteria group is determined in accordance with the following formula:

$$\omega_{ij} = \frac{\max \gamma_{ij}}{\sum_{i=1}^{kj} \max \gamma_{ij}} \omega_j, \tag{4.8}$$

where $\sum_{i=1}^{kj} \max \gamma_{ij}$ – the maximum possible number of credits of the k criteria of the j criteria group, ω_j – significance of the j criteria group.

Upon completion of the analysis of the building sustainability assessment criteria and transformations using the breakdown and balance method the significances of the assessment criteria groups have been determined (Figure 4.4.).

Thus, the recreational complex RE sustainability assessment model in accordance with the groups of sustainability assessment criteria takes the following mathematical expression:

$$V_{sust.g} = 0.1243\sum_{i=1}^{5} v_i(\text{Management}) + 0.13\sum_{i=1}^{6} v_i(\text{Health}) + 0.1507\sum_{i=1}^{8} v_i(\text{Energy}) + 0.068\sum_{i=1}^{5} v_i(\text{Transport}) + 0.06\sum_{i=1}^{4} v_i(\text{Water}) + 0.0625\sum_{i=1}^{5} v_i(\text{Material}) + 0.0438\sum_{i=1}^{3} v_i(\text{Waste}) + 0.06\sum_{i=1}^{5} v_i(\text{Land}) + 0.0712\sum_{i=1}^{5} v_i(\text{Pollution}) + 0.2295\sum_{i=1}^{9} v_i(\text{Additional}) + 0.10\sum_{i=1}^{10} v_i(\text{Innovation}), \quad (4.9)$$

where v_i(Management), v_i(Health), v_i(Energy), v_i(Transport), v_i (Water), v_i (Material), v_i (Waste), v_i (Land), v_i (Pllution), v_i (Additional), v_i (Innovation) are the significances of the normalised values of criteria of the management, health and welfare, energy, transport, water, material, waste, use of land and environment, pollution, additional criteria and innovations groups and criteria in the groups, while the coefficients located before the summation symbols are the significances of the groups of those criteria.

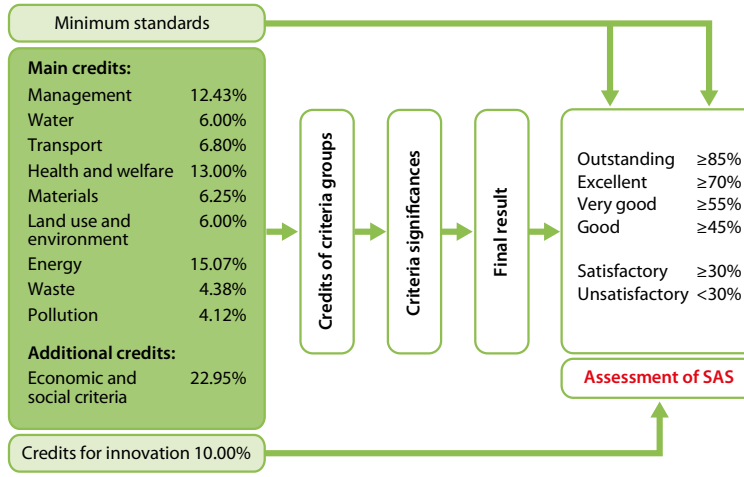

Figure 4.7. Recreational complex real estate sustainability assessment system scheme

The latter model may be defined in other way, taking into consideration the three sustainability principles. Thus the proposed recreational complex sustainability assessment model takes the following mathematical expression:

$$V_{sust.p} = 0.33\sum_{i=1}^{k} v_i(e) + 0.34\sum_{i=1}^{i} v_i(s) + 0.33\sum_{i=1}^{m} v_i(ec), \quad (4.10)$$

where $v_i(e)$, $v_i(s)$, $v_i(ec)$ the values of the environment protection, social and economic criteria, $\lambda_e = 0{,}33$; $\lambda_s = 0{,}34$; $\lambda_{es} = 0{,}33$ – the significances of the environment protection, social and economic criteria. Thus, in our case $V_{sust.g} = V_{sust.p}$.

The proposed model reveals the application of three principles of sustainable development to the building development better. Therefore its application is recommended in assessment of sustainability of recreational complexes. The sustainability index, which may be used for comparison of projects and selection of the most efficient option in terms of sustainability, has been determined. By applying this model, there has been created a recreational complex sustainability assessment system. The created recreational complex RE sustainability assessment model has become a base for the created SAS. Based upon the analysed building sustainability assessment systems and the BREEAM New Construction 2011, the SAS whose overall scheme is presented in Figure 4.7 is proposed for assessment of sustainability of recreational complexes RE. The proposed SAS is designed for assessment of projects of recreational complexes. It is focused on the assessment of buildings according to the balanced (equal) sustainability principles in environmental, economic and social terms. The assessment scale in accordance with which a building may be assessed covers the following ratings: satisfactory, good, very good, excellent and outstanding. Thus, this system comprises:

1. A set of recreational complex RE sustainability assessment criteria which consists of the main, auxiliary and innovation criteria. The main criteria include the groups of management, health and welfare, energy, transport, water, material, waste, land use and environment and pollution criteria; the auxiliary – 6 social and 3 economic criteria and 10 innovation criteria separately. The criteria requirements and their descriptions are also presented.
2. Group criteria credits possible to be gained.
3. Credits assigned to the group criteria by an expert.
4. Significances of the abovementioned criteria groups.
5. Assessment of separate criteria groups in percentage terms taking into consideration their significances.
6. Determination of the result of general assessment.
7. Minimum credit requirements for rating.
8. Determination of final building sustainability rating based upon the minimum credit requirements and overall assessment result.

In order to perform a specific assessment, the minimum requirements of criteria assigned to the credits have been determined in the criteria groups, e.g. energy, water, waste and etc. The recreational complex RE SAS is supplemented with the minimum requirements of credits assigned to the additional criteria in order to insure that the main sustainability principles are not missed during the rating of buildings. A recreational complex under assessment may be assigned an

appropriate rating only after the overall assessment result of all criteria in percentage terms has been calculated, and it still meets the minimum criteria credits.

In order to facilitate the assessment and processing of the results, a calculator was created using the Microsoft Excel program. The assessment of sustainability of recreational complexes is performed in the main subsystem whose significances of criteria have been recalculated taking into account the three principles of sustainability, and in the auxiliary subsystem where the significances of proposed criteria have been determined using the AHP method. During the determination of the sustainability rating the assessment process covers the following:

1. The assessor assigns or does not assign a specific number of credits to each criterion in the assessment groups. Then the program performs calculations itself.
2. The percentage of assigned credits is calculated for each assessment criterion.
3. After multiplication of percentage of the credits assigned to the criterion by the significance of the recalculated criterion, the assessment of that criterion is obtained.
4. The results of all criteria groups are summed up when determining the overall assessment. Then, the overall result is compared using the rating scale and, if all minimum requirements of credits assigned to the criteria have been met, the actual assessment rating will be achieved.
5. The final assessment will include the credits assigned to the criteria of the innovation group, however, not exceeding 10%.

Having applied the experience of the building SAS leaders, selected the criteria for assessment of recreational complexes, included the group of additional economical and social criteria and having determined the criteria significances again, we created a model based upon which the recreational complex SAS works. Application of this system would insure the sustainable development of recreational complexes.

The following section will demonstrate the suitability of the recreational complex RE SAS for assessment of sustainability thereof through the example of Druskininkai Snow Arena.

4.4.3. Studies of the suitability of the recreational complexes sustainability assessment system for practical use

This section presents the studies of suitability of the recreational complex RE SAS for practical use with Druskininkai Snow Arena selected as an item subject to assessment, demonstrates the sustainability assessment of the Arena according to the proposed SAS. The sustainability of the Arena, necessary to perform a control function, has been assessed according to the BREEAM New Construction 2011, and the comparison of results is provided.

The ski slopes centre Snow Arena is located in Druskininkai – the southernmost city in Lithuania situated near the borders with Poland and Belarus. The Druskininkai City Municipality, which had been analysing the situation in the field of provision of winter entertainment services in Europe for several years, made a decision to implement the project "Druskininkai Closed Ski Slopes with Artificial Snow Covering" jointly using the funds of public, private and EU Structural Funds. In June 2009, there was signed a concession agreement between the Druskininkai Municipality, Closed Joint-Stock Company (CJSC) "Stamita". The winter entertainment centre named Snow Arena started operating on 25 August 2011, and became the first unique winter entertainment object in the Baltic States. The total cost of project was 110.7 million litas, of which 40 million – funds from the EU Structural Funds and 70.7 million litas were invested by CJSC "Stamita" (Druskininkai City... 2012). Currently there are about 50 closed ski slopes operating worldwide. Most of them, about 30 are in Europe Europoje (Indoor ski slope 2011), however, the closest ones are at a distance of about 1,000 kilometres.

Ski slope centre Snow Arena is a structure covering a territory of 8 hectares, where three ski slopes with snow cover designed for skiing and snowboarding are installed under one roof. This structure has been designed for both winter entertainment lovers and professional sportsmen who can ski here all year round. Snow Arena is one of the largest and most modern closed ski centres in Europe, and by its set of technical parameters it aspires to be included in the world's top five indoor ski resorts (Snow arena 2011). Other technical parameters of the Arena (Figure 4.8):

- Main area: 29719.60 m^2 (Overall heated area: 5468,09 m^2; Overall cooled area: 24903,08 m^2; Auxiliary area: 1787,37 m^2);
- Overall area: 31462,08 m^2;
- Overall length of the slopes – more than 1100 m;
- The height of hills – 66 m, incline – up to 25 %.

The ski slope complex Snow arena consists of: 2 closed ski slopes operating all year round, an outside slope which starts operating when the outside temperature falls to –5 °C, a snowboarding park, equipment and clothing rental points and service points, a skiing school DruSkiSchool, a children's entertainment park DruFunPark, shops, restaurants/bars, WC for disabled people, mother and child rooms, a terrace with panoramic view, smoking areas, Wi-Fi areas and a parking area for 380 cars (Figure 4.9).

The main ski track is designed for advanced and professional skiers and snowboarders. Training, tournaments and ski lessons with instructors all take place on this track. The track is open all year round. The width of the track is 50 m and its length is 460 m. Three slopes are designed for skiing and snowboarding. The Beginners' Slope – a special two-level track is provided for skiing lessons with instructors and for beginners. The track is open all year round. The length of the track is 150 m and its width is 40 m. The outdoor skiing track is designed for

Figure 4.8. Druskininkai Snow Arena (*Source*: Authors)

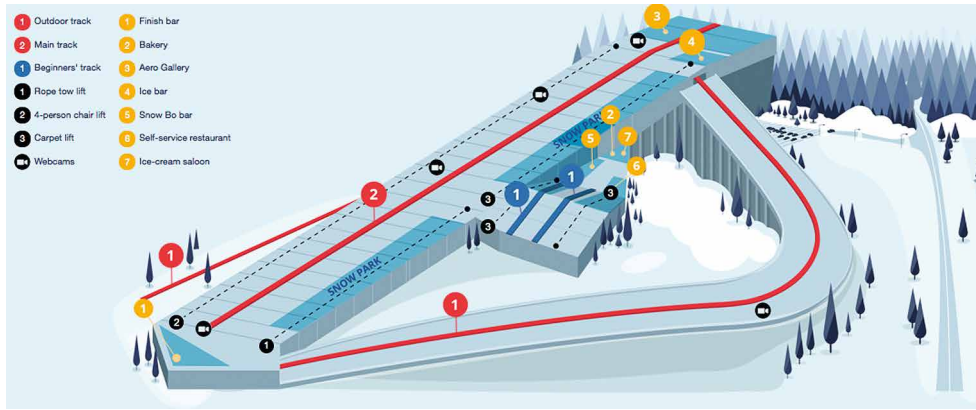

Figure 4.9. The Plan of Druskininkai Snow Arena (Snow arena 2011)

advanced and professional skiers and snowboarders. Training and tournaments take place on this track, which is connected to the main ski track and is open during the winter season when the quantity of snow is sufficient, and when the air temperature is below –5 °C.

The abovementioned and other data on Snow Arena centre will be used in determination of sustainability thereof by applying the proposed recreational complex RE SAS. According to the SAS, the sustainability of Druskininkai Snow Arena is determined by assessing each of 11 groups of criteria assigning a specific number of credits, or not assigning any credits at all if its specific requirement has not been met. Each criterion is assessed by determining its execution in percentage terms and multiplying by the significance recalculated out of it. The calculations of sustainability of Druskininkai Snow Arena are presented in Table 4.7.

In the main assessment system, the criteria of 10 groups, excluding the additional ones (10 groups), earned 47.52%, which would correspond to the good evaluation of sustainability. The SAS in the group of additional criteria of Druskininkai Snow Arena earned 18.30 %, whilst the overall assessment result is 65.82%. In accordance with the result obtained, the Arena's sustainability may receive a very good sustainability rating. It is granted when the evaluation is ≥ 55%. This rating

is also satisfied by the required minimum criteria credit number: *Management 01, Health 01, Health 04, Energy ,02, Water 01, Water 02, Material 03, Land 03, Social 03, Social 06, Economical 01, Economical 02.* Therefore, based upon them the rating "very good" may be granted.

Table 4.7. Determination of Druskininkai Snow Arena sustainability under the proposed sustainability assessment system final calculations

No	Groups of criteria of the recreational complex SAS	Credits assigned	Possible credits	% of credits assigned	Significance	Results, %
1	Management	11	21	52.38	0.1243	6.72
2	Health and welfare	12	15	80	0.13	10.75
3	Energy	16	29	55.17	0.1507	8.65
4	Transport	8	10	80	0.068	5.60
5	Water	6	9	66.67	0.06	4.35
6	Materials	5	9	55.56	0.0625	3.47
7	Waste	3	6	50	0.0438	2.34
8	Land use and environment	3	10	30	0.06	1.72
9	Pollution	6	13	46.15	0.0712	2.92
10	Additional social and economical criteria	25	34	73.53	0.2295	18.30
11	Innovations	1	10	10	0.1	1.00
Final result of the recreational complex SAS					65.82%	
Rating					Very good	

The assessment of sustainability of Druskininkai Snow Arena for the control function was performed using the BREEAM New Construction 2011, which, as it has been established previously, assigns 2/3 of its criteria for assessment of the environment protection aspects (Table 4.8). After the assignment of the centre to the non-residential type of buildings, it will be assessed according to ten groups of criteria that have different weights. 56.65 % has been obtained in accordance with the BREEAM New Construction 2011. Since the building has met the minimum compulsory requirements as well, it is evaluated as very good.

The difference between the evaluations using the proposed recreational complex RE SAS and the BREEAM New Construction 2011 was 65.82 – 56.65 = 9.17%. A better evaluation has been acquired because the significance of social and economical criteria of the SAS was increased whilst of environment protection – decreased. After the BREEAM New Construction 2011 was taken as a basis in the main assessment system and after recalculation of the criteria significances using the breakdown and balance methods, the criteria of 10 groups, without the additional ones (10 groups) gathered 46.41%. This evaluation is less

by 9.13% (56.65–47.52) than in case with the BREEAM New Construction 2011 because the significances of environment protection criteria have been reduced. Thus, the recreational complex RE SAS appeared to be suitable for assessment of sustainability thereof and, as it was expected, a higher evaluation has been received after the introduction of additional social and economical criteria.

Table 4.8. The aggregate results of the assessment of Druskinininkai Snow Arena using the BREEAM New Construction 2011

BREEAM Section	Section Weighting	Number of BREEAM credits available	Total predicted BREEAM credits achieved	Indicative (weighted) Section Score, %
Management	0,12	18	14	9,33
Health and well-being	0,15	17	16	14,12
Energy	0,19	26	13	9,50
Transport	0,08	14	10	5,71
Water	0,06	9	5	3,33
Materials	0,125	15	6	5,0
Waste	0,075	8	3	2,81
Use of the land and environment	0,10	10	2	2,0
Pollution	0,10	13	5	5,0
Innovations	0,10	10	1	1,0
Final BREEAM Score				56,65
BREEAM Rating				VERY GOOD

In Druskininkai Snow Arena, in accordance with the performed cases of sustainability assessment using the recreational complex SAS RE and the BREEAM New Construction 2011, a large part of requirements of the criteria of all three sustainability assessment principles comply with the latter. Therefore it may be argued that it is a very good example of sustainable development of a recreational centre.

The recreational complex RE sustainability assessment model can be replicated, i.e. applied to buildings of other purposes, but determining specific criteria and involving more experts from different areas (users, developers, etc.). Based upon the model offered, there has been created an SAS for recreational complex RE covering the groups of the main and additional criteria with the set significances, difference between credits, overall evaluation in percentage terms, minimum credit requirements and establishment of the final sustainability

rating. By applying this SAS, it is possible to determine sustainability of various recreational complexes and compare them.

The recreational complex RE SAS would enable the sustainable development thereof, it would help to reduce the use of natural resources, CO_2 emission, stop the climate change, increase the use of recoverable energy sources and improve the quality of life. The recreational complex RE SAS is suitable for assessment of sustainability of such buildings, it considers the requirements of social and economical criteria better than other systems. The assessment of sustainability would enable to achieve the stated objectives of a project, and, from the perspective of the factors of successful management, it would help to secure the eficiency of strategical management.

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V. CURRENT TRENDS AND STRATEGIES OF SUSTAINABLE DEVELOPMENT

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With the development of real estate objects one should understand the history of sustainable development in the urban context. Obtaining knowledge of history may contribute to promoting full disclosure of our tasks being dealt with and allow assuming feasibly rational positions. Seeking to condense the knowledge of history one should take two most important events into consideration: the Neolithic Revolution and the achievements and problems of urban development in the 18–20th centuries which we are faced with in the 21st century while searching for urban development solutions.

One should not ignore a historic moment of the Neolithic Revolution as the last glacial period ended about twelve thousand years ago. The climate was getting warmer and almost a quarter of the Earth was covered in glaciers which were moving north. Theretofore inhabitants were leading a peripatetic existence, while in the Neolithic period they started to dwell in one place or in the same territory. Living in one place is an urban feature; hence in this sense the beginning of urban development lies in the Neolithic period.

Businessmen working in the sphere of real estate pay attention to the 18–20th century period which can be described as a period of rapid development (the number of cities and their inhabitants was increasing). At present, the examination of and solution to urban problems turned into the branch of science and the favourable outcomes of urban development planning (garden cities, a renewal of historic city centres, new towns, the ideas of modern city reconstruction and sustainable development which came into existence at the end of the 20th century) and "failures" (liberal urban development when the developer is given a lot of freedom, the deterioration of sanitary conditions, the division of urban functions into zones, the movement of dwellers beyond the city, the use of natural resources) were revealed. At that time the way of dividing the present-day activities between private and public sectors in urban development was formed, a contemporary scheme of distributing societal and individual (the developer of real estate) functions was established, and current urban problems increased (the process of city centres becoming empty, the use of natural resources, urban explosion, the dependence on cars, and so forth). This historic period of urban development is perhaps most comprehensively analyzed and described in L. Mumford's and J. Jacobs's books (Mumford 1961; Jacobs 1961).

Within two historic "points" of reference that is the origin of a phenomenon (city) and an epoch of major changes in global urbanization, we can "draw" a

line of urban history reaching our present days in which the ideas of sustainable development are extensively utilized throughout the world. Acknowledging the fact that modern cities are an important driving force for further economic, social and cultural improvement, there open up new possibilities for contemporary developers (especially in the post-Soviet space) of real estate to implement various projects which could enhance the quality of urban environment and that of life. However, the validity of an optimistic point of view must be proved in practice as the 21st century cities agree to have accumulated huge environmental, social and economic problems whose solution increases the costs of real estate development and sometimes even prevents it from being implemented.

This Chapter discusses three questions in general terms: "What are the major problems cities are undergoing at present?" and "How does one attempt to solve these problems?" in other words towards what one is trying to direct the urban development, what perspectives of global urbanization changes are and what challenges one can be faced with in the future.

5.1. The emergence of the concept of sustainable development, its definition and criticism

The 20th century was characterized by a rapid economic growth and urban development which required a more intense use of natural resources, thus raising the level of environmental pollution; in the seventh decade of the 20th century it increased such that there emerged a threat of an evident ecological crisis in the world. It was high time in the second half of the 20th century to virtually reconsider global priorities of societal development and decide upon the trend of further improvement. The provisions for sustainable development were formulated in the Commission's report "Our Common Future: The World Commission on Environment and Development" which was delivered in 1987; the Commission was chaired by Gro Harlem Brundtland, then Prime Minister of Norway. This Commission defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

Three components of equal value lay the foundations for sustainable development: environmental protection, economic growth and societal development. *Agenda 21*, the Rio Declaration on Environment and Development approved in 1992, states twenty seven essential principles for sustainable development and presents a program of its implementation. The Charter of European Sustainable Cities and Towns Towards Sustainability (otherwise known as the Aalborg Charter) was approved in Aalborg, Denmark, 1994, signed by more than two hundred cities and towns. For instance, in 2004, Vilnius city in Lithuania also joined this Charter and was committed to following a principal trend of sustainable

development in contemporary urbanization, as well as conserving social, economic and cultural resources which are limited and most often non-renewable.

The ideology of sustainable development we entered the 21st century with appears to be a rather innovative idea; partly, it is not, however, a new goal. In the development of history, when encountering certain problems, one would always search for solutions. For example, at the end of the 19th century, urban planners proposed the garden city model to cope with an imminent degradation of cities. Economists have mentioned the notion of sustainable development since 1970 while praising a zero growth as a must to apply in order to obviate ineffective development. Foresters have been using natural resources for a long time so as to ensure forest maintenance and development. However, critics treat sustainable development with scepticism (Arnould *et al.* 2004):

1. It does not indicate what future generations are referred to: the future generations of 2025, 2050, 2100 or later years although it straightforwardly concerns moral responsibility of the present generation.
2. It dogmatically adheres to one trend orientated towards the future but does not consider the past.
3. It does not propose methods how to incorporate nonlinear events such as a crisis, wars, climate change, especially when there are no clear reasons of their emergence, into this linear vision of time.
4. It is not clear how one can evaluate this phenomenon as the development of different domains that is social, political, environmental and economic spheres, occurs at a different pace
5. It does not answer the questions: “Is it possible to precisely foresee the needs of future generations?” and “Is it not the way to consciously or subconsciously deny the possibility of future generations to create their own living?”
6. It does not highlight the priorities at local and global levels. A leitmotif of *Agenda 21* “think globally, act locally” is rather a schematic reference between global and local scales, for it does not answer who will “think globally” and whether local people will just carry out the instructions given by huge international organizations. In spite of the fact that sustainable development is included into global agenda, the most efficient way of its implementation may be realized at the local level. One should invert the *Agenda 21* motto by putting forward the necessity to “think locally in order to act globally”. In other words, the question arises as to whether or not one should accentuate the role of local politicians and practicians in the area of sustainable development and highlight a particular relationship between society and its environment, between the needs of local people and future plans.

Despite criticism, a successful Odyssey of the ideas of sustainable development throughout the world is still going on. In every state, these ideas and their application in practice assume specific features which depend upon the present social, economic and cultural situations. These ideas did not outstrip the cities of the post-Soviet countries which are now moving from centralized development into that of market and democracy.

5.2. Measuring the results of sustainable development

The essential difference between former ideologies of development and the ideology of sustainable development is that the former ones having a fairly strong social support (e.g., the ideas of E. Howard's garden city concept was well-known around the world at the end of the 19th century) did not bother to precisely evaluate one's steps turned to the pronounced well-being of a city as well as to the coherence of urban structures. Influenced by the notion of sustainable development, the systems of indicators are rapidly being created and improved which would allow assessing the reached results in terms of the goals brought forward. Indicators allow one to disclose subtle nuances of life and help both individual and society understand the situation before making social and economic solutions. Among other countries, the United States of America has advanced most in this respect. It was the first country where economic indicators had been established which were urgent during World War I and the interwar period; later they were supplemented by social indicators during the great crisis. In the year of 1970, when celebrating Earth Day for the first time, the system was further complemented by environmental indicators. The integrated system of sustainable development indicators is devoted to measuring the development of sustainability and life quality (Berry *et al*. 2002)

The system of urban indicators *Urban Audit* (Urban Audit 2005) is ascribed to the integrated systems of sustainable development. The emergence of such system was determined by the need to have more comprehensively comparative information concerning a social and economic quality of the environment of European cities and towns. It was satisfactory when conducting an experimental research "Urban Audit" in 1998. Fifty eight European cities participated in this *Urban Audit*. On its basis more cities were included and the system of indicators was specified. The material of urban research was published in 2000. It was widely recognized among municipality mayors, local politicians and administrations. While preparing for the 2007–2013 EU programming stage and seeking to implement the Lisbon Strategy, the audit of 27 states (including their capitals) and 258 towns (incorporating the largest cities) was performed. Lithuanian cities Vilnius, Kaunas and Panevežys were among them. It is a vivid involvement

of urban issues into strategic plans of the highest level (in this case EU). *Urban Audit* is carried out in accordance with three territorial levels:

1. The core city (a city centre in which from five thousand up to forty thousand people live).
2. The sub-city district (according to administrative boundaries).
3. The larger urban area (it is an urban influential zone, the concept known as a functional city region).

The collected data of the *Urban Audit* indicators differs greatly in European cities and towns; it demonstrates major disparities of living conditions, for example, the average household size fluctuates from 1,6 in Stockholm to 3,5 in Ponta Delgada of the Azores (in Vilnius – 3,15). It shows that the way of living and the structure of family in various states are different. The number of house owners is the lowest in cities in Germany – in Leipzig 11% of all households, in Berlin 12%. These indicators differ from those in cities in Spain such as Logroño (86%), Murcia (86%). Amsterdam and Rotterdam are distinguished by the supply of social housing from other towns (56% in both cities) (in Vilnius – 10%). The highest life expectancy (of 81 years) is likely to be in Bologna, Italy. The highest level of crime per year – 1/4 residents was recorded in Liège, Belgium. The majority of students from higher education institutions, that is more than 28% of all residents, were registered in Darmstadt, Germany. The majority of those graduating from higher education institutions is in Paris (37%), in Cambridge, Edinburgh, Tallinn, Dresden, Helsinki and Vilnius – even 43%. It reveals the potential of social and economic knowledge which undoubtedly has an impact on the quality of urban life. Research on the variety of living conditions in EU cities is complemented by scientific investigations into the satisfaction with life in the city which are conducted by using the *opinion survey*.

The results of *urban audit* and *opinion survey* of EU cities have highlighted two essential moments: firstly, there are no standard cities; every city is unique and inimitable. Identifying the problems of urban development in every city, the planning and management of urban development assume many individual characteristics. Secondly, it is risky to compare urban indicators of separate cities, for it is possible to draw misguided conclusions (although one likes to refer to the practice of manipulating indicators). We should state that statistical comparison of the totality of two or more urban indicators may be impartial. Comparing indicators in various spheres, it is feasible to conduct analysis at various levels.

Having performed the research on the system of urban development indicators, one can notice that all contemporary systems of urban development indicators embrace social, economic and environmental spheres; however, when applying them in one place, one should create unique systems for a particular project by having evaluated the particularities of the place and prevailing trends. It is the foundation for making reliable long-term decisions.

5.3. The costs of sustainable development

Sustainable development as a higher life quality has its own costs and is associated with a much bigger need for financial resources in comparison with other development principles. In the world, in Europe, and especially in new EU Member States, among them is Lithuania, urban possibilities are extremely limited seeking to meet the needs of developing urban infrastructure (engineering, social, environmental). Notwithstanding the requirements for territorial planning documents and ambition laws, it becomes clear that sustainable development is dependable not only on well-planned territorial strategies and rational land use but also on financial resources which one is always lacking in. Making solutions related to the development of real estate is an exceptionally significant way of strategic territorial planning. It allows one to learn what costs of infrastructure development and price of exploitation will be before deciding upon what level the urban development can be conducted at and how many investments of the private capital one can attract or maintain. When ignoring the urban planning and development of adequate infrastructure, we violate the principles of sustainable development: disimproving life quality and borrowing from future generations.

Some valuable examples of sustainable development policy are found in Canada whose city Vancouver has long been acknowledged as the city with the highest quality of living, as well as in Scandinavia. One can observe the policy of the U.S. Department of Housing and Urban Development, Washington: public funds shall ensure the creation of infrastructure of strategic nature and new development must “pay” for it. Infrastructure development of municipalities in many developed Western countries is regulated by special laws wherein this development is partly maintained by Development Cost Charges (DCC) which municipalities collect from land developers. Cost charges are clearly set and applied to all developers, for example, since 1958, in Canada the development of charges has had three stages: municipalities had enough resources to develop infrastructure by using private capital investments for urban development. With an increase in the amount of private capital investments and in the event of municipalities lacking funds, in every particular case there were negotiations taking place with a concrete developer. However, for a long time such practice became not transparent, stimulated corruption and judicial disputes. This experience was described, improved and legitimized (Development Cost Charge Best Practices Guide 2000). This type of practice is applied in many cities and towns in the USA and the UK. etc. Such order was introduced in Lithuania, first in the Vilnius City Municipality. Referring to the developed practice and foreign experience, the law regulating public infrastructure development is being prepared in Lithuania at present.

5.4. In search of the problems of contemporary cities and their solutions

The picture of urban problems depends on two factors: 1) the reality of life in cities, and 2) through what prism of values one looks at it. Taking it into account, the pictures of problems in various cities can be dissimilar. The concept of sustainable development is, however, a particular integral instrument of diagnosing the condition of all cities and towns which allows one to conceive a certain affinity of urban issues. Here are the key indicators of this "instrument" which are stated in the renewed EU sustainable development strategy (Renewed EU Sustainable Development Strategy 2006).

Environmental protection: To conserve the Earth's resources to maintain life in its diversity, consider the boundaries of natural resources and ensure a high level of environmental protection and improvement of its condition. To impede and reduce environmental pollution, incentivize the use and production of non-impoverishing resources, isolate economic growth from environmental degradation.

Social equality and social structure: To maintain a demographic, socially inclusive, collective, healthy, and fair society paying respect to the human rights and cultural diversity; the society which provides equal possibilities and repudiates any form of discrimination.

Economic well-being: To sustain a prosperous, innovative, knowledge-based, competitive and ecological economy creating conditions of high quality of life and providing residents with high quality jobs in the whole European Union.

The afore-mentioned tasks are the very goals of cities incorporating the Concept, while incongruence of the state of a concrete city with these goals is the city's "diagnosis".

Below we will present frequently occurring urban problems and endeavors to resolve them. It is understandable that it is not a "compulsory" list of urban problems; it is a list of those problems which cities are often faced with. In concrete cases, "diagnoses" can definitely be different.

One can say to a person wishing to understand how to form a city corresponding to the concept of sustainable development but having no time to deepen into the relationship between problems and their solutions: there are four essential features of urban functional and spatial organization which are proportionate to the concept of sustainable development:

1) a city must be compact (within the framework of common sense);
2) the use of urban territory must be balanced (this principle is sometimes expressed in other words: "urbanization must be miscellaneous");
3) a system of social infrastructure must be realized in stages;
4) urbanization should not uptake new natural territories, especially – step in the most valuable protected natural territories.

We will explain some afore-indicated desirable features of urban organization.

Urban planners treat the compact city (smart growth) as a city wherein urbanized areas are closely interrelated, not "scattered" in the territory. In brackets we have pointed out that the "marriage" of these areas must not be carried out thoughtlessly; to the contrary, there must be bigger and smaller green areas in the urban territory. When saying "scattered", we consider separate places spread in the territory, groups of places or uptowns distanced from urban infrastructure and workplaces.

Balancing the use of urban territory – a miscellaneous use of territory – implies such organization of urban functions that one may get everything he needs in every place of the city he lives in: housing, work, services (social infrastructure) and the possibility for leisure activities. It is the opposite principle of urban organization prevailing in the first half of the 20th century. At that time it was accepted that what was happening in a city had to be categorized and every type of activity had to have its own territory (see "A Brief History of Urban Development"). Inhabited and industrial territories (constituting the biggest part of work places) were most clearly separated from each other and housing development and industrial areas were consciously planned. Urban, industrial, service-related and recreational territories were (and sometimes are) fairly strictly categorized: a residential territory was such that there were neither shops nor drugstores. If it was a supermarket, then one would not see local people within several kilometres from it (there are some examples when supermarkets were built in the field outside the city). Not only did theorists working in the sphere of urbanization in the first half of the 20th century categorize urban functions, but also other factors sometimes determined differentiation of the use of urban territory. At any rate, it is often a common phenomenon in cities.

The "stage-related system of social infrastructure" is the principle which is very close to the afore-mentioned principle of miscellaneous urbanization and is worthwhile mentioning again separately. This system implies that all the functions of services for residents living in the city are not incorporated into one (or several) centres; instead, the system of centres of several stages is formed. Such stage-related system can be formed by circumstances under which residents do not often utilize all services provided by the city. It also reveals the fact that daily services in the city are close to the residents, that is one can reach them on foot. Other rarely used services can be allocated further – at another distance "stage" (Urban Environment...).

Speaking of the above-mentioned principles corresponding to the concept of sustainable development, it is essential to pay attention to several issues.

The *first* issue embraces a fully equipped modern city in terms of engineering development and reasonably formed urbanization in terms of architectural consideration. For example, heating dwelling houses and industrial enterprises

by using solid fuel boilers will not conform to the concept of sustainable development; moreover, if buildings are designed such that a neighbour having breakfast is forced to see what is on the opposite living neighbour's plate, it will not arouse a great deal of contentment among residents, too.

The *second* issue, which has to be specifically highlighted, is that this type of urban organization will be valuable to society as a whole, but it may not be attractive to its separate members in certain ways. For example, it will not be economically profitable to those who have procured land plots in different places around the city with the intention of selling them for construction – nor will it be profit able to those who definitely wish to live in non-urbanized areas, close to the water, and can afford to travel long distances to get to work and bring children to school. There are some ways how one can resolve both personal and social conflicts of interest, but it will be another topic which we will not discuss here; we will just mention that in many cases new and qualitatively obtained knowledge as well as a respectable exchange of public goods extricates the conflicts of interest.

5.5. Sustainable development strategies

At first, one has to ascertain why there is no need to continue the trends of urban growth, and in the second place – why cities should be more compact? There are many reasons for it. We shall tangle them by referring to one of the most significant elements of urban organization (which influence the urban contribution and the state of world ecology)–transport problems. People use cars to travel and transport goods, which is extremely important in life. At the same time, however, road transport is one of the biggest polluters of the environment. Transport is not the highest "generator" of CO_2 (carbon dioxide which results in the greenhouse effect), but it contributes to its increase. For example, at present individual cars produce around 10% of the EU's total emissions of CO_2, thus participating in climate change [10]. In the European Union (EU 15), transport releases 40% of pollutants such as "CH4, CO, NMVOC and NOx" into the atmosphere – ozone precursors. It is a negative contribution to the ecological state of the planet. The presence of people in zones with a high concentration of ozone weakens the functioning of the lungs. Road transport "generates" approximately 25% of primary particles (dust). Vehicles emit nitrogen dioxide into the environment. From 1996 until 2005, from 21% to 47% of people lived in cities where NO_2 reached 40 $\mu g\ NO_2/m^3$ which is a critical limit. Even in urban areas where the amount of NO_2 is lower, a critical level of pollutants can be reached in separate parts of the city, primarily in the largest places wherein transport concentration is the highest (European Environment Agency... 2000).

Specialists maintain that a permanent exposure of people to the polluted air in the largest European cities accounts for about 60.000 thousand deaths in 2010 (Air pollution costs European economies US$ 1.6 trillion a year in diseases and deaths, new WHO study says... 2015).WHO reports that the air pollution in cities throughout the world results in around 7 million deaths in 2012 (7 million premature deaths annually linked to air pollution. WHO). Not without reason is it stated in the Communication of the European Commission to the Council and to the Parliament that "transport plays a leading role in terms of climate change, air quality and sustainable development" (Communication from the Commission to the Council and the European Parliament on Thematic Strategy on the Urban Environment... 2006)

Searching for the ways how both functional and spatial organization of a city can contribute to the resolution of this problem, one adheres to two trends. The first deals with shortening travel distances by car and reducing the necessity to use it. The second is devoted to searching for such a functional and spatial organization of a city that would increase the possibility to naturally process pollutants or at least not diminish it.

5.6. The model of the compact city development

Let us discuss the first trend of searching for the possibility to reduce vehicle emissions, in other words in what way urban organization can influence the mobility of people. It is the compact city that helps minimize this mobility. The logic is simple: the closer everything is situated, the shorter driving distances are. Shorter driving distances mean less gasoline is combusted.

Research demonstrates that people living in the suburbs (where the density of residents and workplaces is lower than thirty unites per hectare) of Paris spend three times more on daily motorized trips than those living in the city central part (the density is four hundred residents and workplace 1 ha). Not only separate residents but also urban communities derive benefits from living in a more compact settlement: a shorter general length of streets and networks of engineering communications – their construction and exploitation cost less for the urban community.

In a more compact city it is rational to use a more productive, economical and environmentally-friendly mode of transport – public transport. Around the kernel of Vilnius there is an enormous amount of "particles" spread throughout urbanized areas. The development of Copenhagen and other Scandinavian capitals is not chaotically scattered, but has been expanded along the railway lines for many decades (since World War II).

The more residents live near the lines of public transport, the more they use it. The more passengers use public transport, the easier it is for the urban

community to maintain it. The research conducted by Reberto Camagni (Italy) in Milan has confirmed the existence of a positive influence of population density on the use of transport for daily trips back and forth as well as on the average duration of trips by using public transport (Camagni 2002). It is favourable to develop business of services along the lines of public transport used by a considerable number of passengers: the more people are concentrated in one place, the bigger the number of potential clients is. To prove it one refers to the fact that while building a tram line in Houston (the USA), businessmen of nearby territories voluntarily made some financial contributions to its construction. Not only does this solution reduce air pollution and expenses, but it is also useful from the social point of view: people having no cars can easily reach a city. The advantages of the compact city are demonstrated in scientific investigations carried out by P. Newton and other researchers (Newton 2000).

From the social perspective, the compact city is useful in a sense that people spend less time on daily motorized trips – more time can be devoted to work, communication or leisure. Urban planners of the developed Western countries say that a rapid urbanization is expanding around cities and vast areas of the faceless landscape deprived of its own character are being formed here, in other words these are not actual cities, not villages, not natural landscapes. “Why has urbanization of suburban areas in Vilnius and other largest European countries assumed a trend towards urban “spattering”?” One of the reasons is that after reestablishment of independence Vilnius and other post-Soviet city municipalities had no clear development policy, and therefore it occurred spontaneously. Notwithstanding this, any plan will not move along the development of the compact city unless the society and its authority members want it to happen. There was no such will at that time.

Urban “compactness” is inevitably entwined with intensity of the land use. Nestling the area of a city, one should increase the density and height of urbanization. Let us imagine such theoretical experiment: residents decide to settle in a smaller place with their cars. Now everything is closer, but the number of cars is the same. The area of streets has diminished. The cars are cannot spread, but have to fit in a smaller area. It is the traffic congestion and air pollution one is faced with. The fact that it can happen not only in theory, but also in real life is demonstrated by research conducted in the USA. The findings of the research show that if the population density is doubled in a territory, the covered-by-car distance per unit of city area has increased to 80%. The traffic volume described in the theoretical experiment will go up unless residents replace part of their motorised trips by going on foot, cycling and using public transport. As you know, public transport in the USA is relatively less developed than that in the European Union; hence, the above-mentioned results of the research reflect the present state of things in the USA.

However, if the urban land use intensification is accompanied by a change in the way people travel within a city, then we can avoid the above-mentioned problems. A bus carrying 70 passengers is equal to 50 cars in terms of transit capacity. Metro transit capacity is equivalent to 700 cars. Besides much greater transport capacity, public transport has another advantage dealing with the fact that transportation of people going by bus or using trams needs less area of streets than transportation of the same number of people going by cars.

So, it is not so simple to develop the compact city with not high volumes of traffic, in other words to change the structure of traffic in a city. It is important to make public transport for urban residents less expensive and not slower than driving your own car. In order to incentivize townsmen to go more on foot, cycle and use public transport, one must have well-developed appropriate facilities – footpaths, cycle ways and public transport. Sociological studies show that people cover a distance of about 300 meters on foot. One may conclude that what urban residents use every day should be within the afore-mentioned distance from their housing, no further. To allocate all jobs at this distance is unrealistic (although the above-referred miscellaneous type of building would positively contribute to this), but some facilities such as primary health care services, child day care centres (kindergartens), primary schools, daily goods stores, small green areas of common use (for the children to play, for the elderly to rest, and so forth), and public transport stops can be distributed in this way. Nearly 80% of Oslo residents go to transport bus stops no further than 300 m.

We have previously referred to the means of encouraging people to cover distances on foot, cycling and using public transport. Along with them, there are certain means restricting the use of cars in a city which have been applied. For instance, sixty Italian cities (Bologna and others) prohibited traffic in city central parts wherein only public transport and service transport are used. Some towns limit parking lots in central parts of a city. Since 1962, a policy of extruding cars from the city centre has been valid in Copenhagen. In this case, it is worthwhile mentioning that reconstructing the ways urban residents are using to cover distances in a city has positive ecological and social outcomes. Doctors state that the movement of people in general has a positive impact on human health. Research demonstrates that recently urban residents are moving less, spending less time in the fresh air. The lack of movement shortens life up to two years on the average. Hence the means stimulating people to use their cars less, but walk and cycle more also contribute to their health improvement. For example, it is was thought back then in Copenhagen that one could be satisfied with only two summer months during which he could pleasantly spend time outside; at present Copenhagen residents treat two months as unsuitable to do so (Gehl 2007).

Attempting to make cities more compact, we move towards other “recipes”, that is balancing the land use (“miscellaneous urbanization”) and preserving

or creating (if it does not exist) a stage-related social infrastructure. Alongside minimization of the mobility of urban residents, these two "recipes" have other valuable aspects. One of these aspects is the consolidation of communities. It was observed even in the 19th century that global urbanization changed interpersonal communication. Creating (or maintaining) the feeling of community in a city is one of the key objectives established in urban strategic plans of developed countries. This objective is set not by some degraded cities but by those (as the survey shows) which offer the best place to live in. As an example, being the most pleasant city to reside in, Vancouver has put forward the same objective (Strategic Plan City of Vancouver.2008). The existence of the previously mentioned primary service centres is one of the prerequisites for the formation of local communities in cities. In these centres local people gather, their architecture becomes an idiosyncratic sign of that locality as well as a precondition for creating a peculiarity of the local community (see Figure 5.1).The availability of daily service near residential areas increases the safety of the community, in other words not only in a sense that there opens up an opportunity to develop the children's routes to the school so that they can avoid crossing the arterial streets, but also in a sense that the street life is constantly visible from dwelling houses. In the "visually controlled" environment the level of crime is lower. The presence of daily service near residential areas increases its accessibility to people having movement difficulties.

When starting to search for the solution to the transport-related problems, we have mentioned that looking for the ways how functional and spatial urban organization can contribute to the solution of the said problems, we follow two trends. The first is to shorten the length of daily trips by car and diminish the necessity to drive in general; however, it is not possible to completely avoid the environmental pollution (at least in the near future). Alongside minimizing the "production" of pollutants, we move towards the second trend, in other words searching for the ways how one can process the produced pollutants more effectively.

Now, let us consider the second means of reducing urban pollution. One of the main natural instruments (sometimes even the only one) of processing pollutants is our nature. For example, only greenery absorbs CO_2. In temperate zone countries, where the period of vegetation is short, 1 hectare of greenery absorbs about 5 tons of car bon dioxide during the process of photosynthesis and emits about the same amount of oxygen. Throughout one vegetation period the average size of the tree absorbs such quantity of harmful particles (not only car bon but also nitrogen, sulfur and lead compounds, hydrocarbons), which is produced by burning 130 L of petrol [20] (Burinskienė *et al.* 2003).Taking it into consideration, from the ecological point of view, it is relevant to preserve the naturalness of the territory. To some purpose, the territory naturalness is one of

the indicators according to which the situation in Europe is being monitored by the European Environment Agency.

Figure 5.1. Užupis centre in Vilnius illustrates an idea rather clearly that local centres in a city can become a particular feature of that place, a prerequisite for creating a peculiarity of the local community

The European Spatial Planning Network (the European Environment Agency) exercises monitoring of European regional naturalness. Striving to preserve the naturalness of the territory which is affected by urban development, it is not hard to understand: from the ecological perspective, harmless to the environment is such urban land development which does not uptake new non-urbanized areas. Meanwhile, urban expansion into non-urbanized surrounding territories has recently raised a concern. For some time past it has increased up to 20%.

The compact city corresponds to the notion of sustainable development. Before expanding a city into new non-urbanized areas, the country's land naturalness (to which an urban territorial organization is contributed) is an indicator which is interesting not only in the ecological but also in the economic sense. For instance, what makes us give consideration to is the fact that the EU countries with the lowest GDP (among them is Lithuania) have the largest urbanized

areas per unit of GDP. Hence these countries waste the resources of natural land inefficiently (ESPON Sythesis Report III 2006). Land urbanization increases the costs of maintaining the urbanized area, that is the cost of living in a country.

Avoiding taking up new non-urbanized areas is one of the means by which urban development can contribute to the processing of air pollution "produced" all over the world. The compact city is a good way of doing so, but within the framework of common sense. Some proportion of undeveloped and green areas in the city as well as the green ring around it plays a very important role in the life of the city itself. Green arrays serve as the "lungs of the city". The temperature in them during the day is a bit lower than in urbanized areas. From the surface of heated urbanized areas the air rises in vertical currents to the top while carrying altogether harmful additions (gases, aerosols, dust). At that time, cooler and cleaner air flows from greeneries in the place of the ascended air. Urban green areas become somewhat large "chambers" through which fresh and clean air of a higher layer of the atmosphere enters urbanized areas. During the night greeneries cool down slower than urban bricks and paving, so in the morning the reverse process occurs, that is the air from greeneries ascends, while the air from urbanized areas spreads in its place – in greeneries. In this way air ventilation in urban areas takes place periodically. The results of the study show that in a small park it is only 9% lower than that in the urbanized area, whereas in the city park it is 17%, while in the forest park the difference increases up to 23%. We can draw the conclusion that greeneries must be as big as possible and must not be located too far from urbanized areas (Burinskiene *et al.* 2003). For example, Stockholm community underlined the objective of building a city such that it could be no further than 200 meters from residents, include a square park (1–5 ha) and a larger area of public greenery up to a distance of 500 meters apart from its ecological role intended for taking exercise, doing sports, communicating or going on a picnic. No further than 1 km from the housing there is a larger green array (not smaller than 50 ha) wherein residents can swim, go fishing, sledge, go skiing, grow vegetables or do the gardening (Stähle 2002).

What have been referred to above is the features of urban organization which are not related to the peculiarities of the locality including a city. These peculiarities in the context of sustainable development also put forward their own requirements. What is significant here is the fact that there is a certain natural "backbone" of the locality, which is called "natural framework". "Natural framework" is the totality of protected natural territories incorporating the habitats of animals and plants and their interconnectedness. If it is not advisable to develop construction work in new territories, this is the natural "back bone" of the locality which first needs to be protected from the expansion of construction work. In addition to this, its protection can be harmonized with the afore-mentioned tasks of urban ventilation and residents' recreation.

5.7. The strategies of contemporary urban development

It is not possible to transfer the development strategies of one city to another, but it is possible to consider a valuable experience gained by European cities, to learn from it and not repeat mistakes. One can use an experience of cities which are on the *Eurocity* website. These cities apply the following strategies such as a "prosperous city", a "creative city", a "sustainable city", a "city without a disjuncture" and plan to overcome the key threats: a) globalization which has shifted the standardized conceptions of sustainable development, b) international competitiveness which has emerged due to a free movement of goods, services and workforce, as well as due to the private capital attraction from the world's market, and c) the migration of skilled workforce. The environmental issues of protecting the urban environment are now determined not so much by industrial pollution but by high volumes of traffic. The expanded scope of construction work for residential housing on the outskirts of metropolitan cities raises environmental concerns. Modern public transport is central to the strategic development of cities. For example, several years ago Munich or Nantes invested into the relocation of an airport, Copenhagen and Malme– into the bridge construction. Lyons, Stuttgart, Munich, Amsterdam and Rotterdam pursue reconstructing the railway station.

The policy of land use in European countries and the applied strategies are examined by EU funded URBACT projects (http.www.urbact.eu). The experience of European cities is accumulated in the URBACT projects, exchange programmes are taking place. One of them is LUMASEC (Land Use Management for Sustainable European Cities). This project ended in 2010; its participants (Bristol (the UK), Saint Ettiene (France), Bytom (Poland), Kavala (Greece), Baia Mare (Romania) state that the territorial planning of cities embraces not only land use plans/drafts. They maintain that urban planning is:

– *the creation of the reality and future* by applying knowledge and information available;
– *management* (problem solving and management of implementation while using the up-to-date sources of information and data and involving society);
– *the development of human resources* (a systematic education of politicians, administration and personnel, training courses, education of interest groups);
– *the management of urban sprawl* (rarefaction of urban structures into suburban areas). It is a topical issue for most European cities whose human population is decreasing. It is noted that new EU member states had a most consolidated centralized planning culture, and therefore urban sprawl is a comparatively new and pervasive phenomenon which has been steadily gaining impetus. This phenomenon is precarious from the economic and

the ecological points of view. The proposal is that the strategies related to sustainability of urban sprawl be harmonized with the renewal of inner territories. Urban and suburban municipalities must cooperate with each other and coordinate the development plans and implementation activity. Educating and informing the public about the real cost of living standards is necessary, for it is still popular to possess a house with a beautiful garden on the outskirts of town, be surrounded by clean environment and drive you own car. It is important to consider what "future brown fields" need to be converted as manufacturers are not inclined to use the same buildings and territories. They take possession of new areas and are considered to be a driving force of urban sprawl in the future.

– *integrated methods* (establishing the purpose of land use at both regional and strategic levels). It deals with integration of spatial/territorial planning and strategic plans (integration of development-related strategies and land use). One takes into account the following: moving from integrated planning to the creation of the strategy, from maps of land use to the planning of investments, political projects and relations with the budget.

5.8. About the perspective of global urbanization and its challenges

At the end of the 18th century, only 3% of the world's population lives in cities. When the 20th century was approaching, there was about 2,9 billion of people living in urban areas, in other words 47% of the world's population. In 2008, the world became urbanized as more than 50% of people became urban residents. If the present trend continues, the numbers of urban residents will double every 38 years. By 2030, about 5 billion people will have lived in cities (i.e., three out of five inhabitants of the planet). Thus the role of a city with its consequences – advantages and disadvantages – will increase from now on.

Urbanization is apparently associated with human development. *Cities are the "engines" of economic growth*, that is a seedbed of possibilities, a driving force of economic, social and cultural advancement. Effectively managed, they ensure social vitality, economic productivity and environmental sustainability. F. Davidson and R. Dauskardt define the role of cities in the world's economy and in the creation of social welfare as (Davidson *et al.* 2002):

1. Urban development is the essential factor to ensure sustainable economic development by providing products for the local market, export.
2. Productivity of production and marketing depends on a number of actions, including the city infrastructure, the availability of adequate services, and a healthy and educated workforce.

3. Large, densely populated areas allow one to achieve a significant economic effect, providing cultural and educational services, developing social and technical infrastructure. Cities promote the development of the whole region.
4. Urban investments maintain the development of rural areas explicitly (when the city's revenues return to villages) and implicitly (as a possibility to use services, market and information available only in a city).

In the economic sense, cities are the engines of progress; ecologically, global urbanization–human life is not dispersed and takes place in concentrated settlements may also be a positive phenomenon. UN-HABITAT's State of the World's Cities Report 2006/2007 points out that urbanization is the best way to accommodate a rapidly growing number of the world's population in the event of ecological deficit. The essential advantage of urban life is that cities concentrate human activity on limited land areas, thus restricting their impact on the environment (The State of the World's Cities Report 2006/2007). However, it is said in the same Report that cities will play a positive role under the condition that urban planning continues to improve and necessary urban infrastructure is built. The United Nations Conference on Sustainable Development Rio + concludes that notwithstanding that the progress is present, the problems of modern urban development do not decrease, they are being escalated by a rapid and uneven global urbanization as well as by the ignorance of environmental issues. Modern problems lie in the last decade of the 20th century, similar to the situation prevailing at the end of the 19th century when one's environmental responsibility was forgotten [UN 2012 Rio +20, 2012. The Future We Want. The conclusions of the conference in Rio de Janeiro, Brazil. Website reviewed on 15 February 2013. Retrieved from http://www.am.lt/VI/rubric.php3?rubric_id=1535].

Global urbanization is peculiar in a way that large cities (with 1 mln or more residents) grow and will continue to expand. The number of residents.

The world's economic structure is undergoing certain changes; part of industries has decreased since the second half of the 20th century.

The knowledge economy and the services sector have stepped up a gear for some time. Cities of the world are rapidly moving from the industrial to the post industrial era of the knowledge society, based on the use of high-tech, telecommunications and intellectual potential. The development of human resources is sometimes more important than the industry growth. This reflects changes in urban development: the zones of traditional industries are disappearing because knowledge and creativity constitutes the basis of production, and the sectors of services and counselling as well as financial intermediation grow. The fastest growing industry is the high-tech industry (computing, electronics, aviation, and so forth). According to the percentage (indicating the potential of the knowledge economy) of urban residents graduating from higher education institutions,

Vilnius takes a relatively high position in the European Union (the highest proportion of higher education graduates is in Paris (37%), in Cambridge, Edinburgh, Tallinn, Dresden, Helsinki).

Located in a certain geographical territory, firms and institutions interacting and implementing common objectives as well as supplementing each other with their specific activities are gaining more and more importance in cities. They are formed in those sectors in which a country, a region or a city specializes or has the potential to specialize. It has been noted that culture has a similar quality and is also a significant component of urban growth. Investing in culture is associated with the process of forming the city's public spaces, constructing representative buildings, creating an image of urban development and its improvement. Investments aim at enhancing the aesthetic qualities of urban development, reducing separation and encouraging employment, especially youth employment. Along with cultural events the products of cultural tourism are established in respect of natural and cultural heritage. Cultural activities and creative industries are one of the most dynamically growing sectors in Europe and in the world (Euro cities/ EDURC Working Group Final Report "Development Strategies in European Cities 2000). These investments improve the urban environment quality and landscape as well as incentivize people, especially youth, to work.

The changes which have taken place in the economy structure will influence urban issues. The contraction of the industrial sector should reduce urban pollution and allow one to have more freedom to deploy various activities in it; however, other features of economic development pose athreat: the growth of economic activity in general, in particular – growing transport volumes. Cities around the world are rapidly shifting from the industrial to the post-industrial structure of the knowledge society which is based on the use of high-tech, telecommunications and intellectual potential, yet the 21st centuryhas been faced with the following problems (Bardauskienė 1996):

1. The lack of multifuncionality of urban territories impedes the people's economic activity, creates transport's problems and increases the environmental pollution.
2. Most often territorial planning and an architectural part of buildings are not harmonized with the laws of nature: an irrational use of energy resources (75% of energy is consumed by buildings and transport, 25% – by industry).
3. The concentration of people in cities is increasing (currently more than 40% of the world's population is living in cities; there will have been about 61% of people by the year 2025). It does not always correspond to the level of the potential of cities to provide service for them.
4. Developed countries use 80% of all natural resources around the world and constitute 70% of the whole GNP, but only 20% of the world's population lives in them.

5. Due to the inefficient management of urban development, suburban areas are degrading or undergoing the process of urbanization (an uncontrollable urban sprawl, the fertile soil destruction, a distinct culture of suburban areas, and so forth).
6. The inertness of development is hardly controllable by means of planning and administration (of urban development is by 80% conditioned by active powers interested in construction).

The world is foreseen to collide with huge problems of global warming by the year 2020.The decline of energy resources poses a deep concern in the light of urban development, because every year the energy resources actually decrease up to 3%, while their consumption increases up to 5%. It is true that production technology is improving and economic efficiency is increasing, but there is a risk that it will not reduce the pressure on nature. As a result of economic growth, profit (salary) increases or prices go down. Both occurrences lead to a more *intense* consumption, and consequently – to an even greater degradation of nature. Historical experience shows that no matter to what extent technology will advance, consumption (and its increase doing harm to the environment) is always ahead of such environmental damage reduction which is brought by technology improvement. Economists treat this phenomenon as the "rebound" effect. The data collected in the USA shows that in spite of the fact that cars are improving, and consequently fuel consumption is becoming more efficient, an overall fuel consumption continues to grow (because people use more cars, they use them for longer trips). Such is a general perspective of the development of global urbanization.

Urbanization geography will be unique in a sense that the rates of urban growth in the world will be different. The population of Asia and Africa will increase most so will the urbanization of these continents, respectively. It is forecasted that by 2025 Asia alone will have had at least 10 cities with 20 million inhabitants and more. In China, there will be cities wherein 800 million people will have lived by 2020. This suggests that urban problems will be different around the world. These differences will be more highlighted by a different level of the quality of living in the world. The most dramatic process of urbanization will take place in the poorest and less urbanized Asian and African countries. A billion people – one sixth of the world's population – currently live in these countries and a very large number of people live in slums. Here one can see unemployment, poverty, crime, drug addiction, alcoholism and diseases; there was a lack of basic sanitarian conditions (Overpopulation).

When considering a forecast of the demographic status in the world, it is possible to surmise that European cities will experience their own drama. In particular, it is an issue of ageing population and its decrease in general. For example, the indicators of urbanization are similar in all Baltic States; however,

Lithuania is distinguished by having not one dominating city but a network of several larger cities. Although the population of Lithuania is currently decreasing, the number of people living in Lithuanian cities grew throughout the period of one hundred years (see Table 1). In prospect, the number of people in the country is thought to decline; one will encounter an issue of ageing population and the concentration of people in major cities.

In 2000, Europe's population reached 729,3 million people, including 73.4% of those who lived in urban areas. In Europe there are 5000 towns with a population of 5000 to 50,000 residents and nearly 1000 cities in which more than 50,000 inhabitants live (European Commission, DG Regional Policy. Green paper on Territorial Cohesion 2008) There are only five EU cities which fall into the category of 100 largest cities in the world, while the US cities constitute 25%. It is forecasted that after the year 2000 the annual population growth will be negative and decline steadily. The decline in population is associated with lower birth rates and longer life expectancy. The number of people over 65 years old will increase up to 19,8% in the year 2020. However, it is believed that the European urban population growth will stabilize in the future.

The demographic change and ageing population will influence the process of managing the physical environment, constructing buildings, the quality of living, and the structure of real estate: one will need less education establishments, accommodation, and expensive shops in the city centre. More attention will be devoted to the infrastructure of recreation, medical service and nursing homes for elderly people. In this sense, neither the potential of rural settlements nor a regional policy has been implemented yet.

Alongside current trends of urban "contraction and ageing", we can observe a rapid uptake of new areas around cities; this phenomenon is called "urban sprawl". When the family moves to poorly developed suburban settlements in the country, commutations of rural inhabitants increase as there is a lack of jobs, social, cultural, public infrastructure and services in suburban areas. Municipalities are unable to meet the needs of new blocks: the lack of roads, schools, kindergartens and other necessary facilities. Another problem of urban sprawl is tied to the operation of public infrastructure. When there is a need to create a new infrastructure and new roads, exploitation costs are forgotten which the aged society will have to deal with in the future [REAL CORP 2011]

The growing number of private cars is even more problematic. It is not the industry but cars themselves which are the biggest polluters of the environment and "time thieves" of urban residents. Driving a car has become a way of life in some cities around the world (according to the data of monitoring the city's general plan, in 1993, in Vilnius 82% of the population used public transport, while in 2012 only 39.6%).

When planning the development of real estate, it is hard to expect a higher public contribution to the development of infrastructure around the world. Some researchers assume that in the 20th century developing countries depended on developed ones, while in the 21st century developed countries will depend on developing ones. The situation of the near future is described in this way, because a rapid growth of cities and population in the Southern Hemisphere will bring about global issues. Economy, planning, management, the ability to provide people with jobs, housing and essential services will, however, grow insufficiently. In respect of urban development, the depletion of energy resources raises a concern: every year they decrease up to 3%, while their consumption has increased up to 5%. The largest share of energy – 50% is consumed by buildings, especially by non-renovated apartment houses.

5.9. Further dissemination of the ideas of sustainable development (limits to growth, social capital, viable economy, and how to meet the people's needs?)

This chapter focuses on a deeper and more comprehensive understanding of the phrase "sustainable development" and how it can be applied in practice. This phrase "sustainable development" is recurred in every political document or urban development plan. It seems that almost everything what is done in (and most often even beyond) the public sector is related with "sustainability". The notion of "sustainable development" is, however, a dynamic and controversial phenomenon; it is evolved and understood differently nowadays and will change in the future.

"**Limits to Growth**". In the 1980s, a group of researchers supervised by D. Meadows conducted a scientific research on the state of the planet and announced their findings in the book "Beyond the Limits", later – "Limits to Growth". According to the researchers, the use of natural resources has gone far beyond the framework of commonness and it is high time we undertook radical measures to save the world. They claim that in order to reduce human demand on the environment such that nature can bear it, in 1995, industrial output per person had to be no bigger than 350$ (that is one-fifth of the average of the present world). The researchers maintain that when seeking to lessen the use of nature to the extent that it can endure that use, one should not only reduce the volumes of production but also introduce birth control (two children for a couple), and virtually having enhanced the efficacy of technologies, the world's population would reach 7.7 billion in the year 2050. This number of people, according to the authors, could exist in the presence of a sufficient amount of food, consumer goods and services.

It was the scientists who first clanged a bell, but soon politicians – the authority got interested in this ecological issue. One should admit that the phrase denoting "sustainable development" as 'regulating economic and social development such that it can meet the needs of the present without compromising the ability of future generations to meet their own needs' sounds fairly abstract. "What does it imply?" Ecologists say that it is possible to recognize three groups of separately functioning resources of nature. We need to discuss them as their character determines how human beings behave with them.

The **first group of natural resources** is life species and ecosystems which survive and reproduce themselves by using solar energy and photosynthesis. They perform two functions. First, they provide wood, fur, fish, and so forth for a person. In the presence of the system of market economy, they reach the consumer by entering the market. Apart from this function, some of them perform another role. For example, forests assimilate carbon dioxide, produce oxygen and contribute to the regulation of climate. These are vitally essential services to humanity. Natural resources of this group are sometimes referred to as the "renewable natural capital". The word "renewable" is used because this capital is "regenerated": grass regrow, forests reforest, and the like. This capital is reproduced only on condition that there is a sufficient amount of it to be regenerated.

The **second group of natural resources** embraces ground water, rivers, the ozone layer, and the like. They also perform several important functions. For example, rivers may generate electricity. Some of them generate valuable benefits which do not enter the market such as protection from ultraviolet radiation, and so on. These are not life species but are similar to them; they can reproduce themselves (using solar energy and through the natural cycles of circulation of these resources). Ecologists treat these natural resources as self-replenishing natural entities. They replenish themselves on condition that the cycle of natural phenomena used to replenish them is not too much affected.

The **third group of natural resource**s greatly differs from the previously mentioned ones. Oil, fossilized fuel, minerals can be held up as an example. The use of such resources, in any case, implies the liquidation of real estate. This is the non-renewable natural capital.

Taking into consideration **these groups of natural resources and their characteristics**, we can attribute a more concrete form to the statement "regulating economic and social development such that it can meet the needs of the present without compromising the ability of future generations to meet their own needs."

"**Ecological Footprint**". Referring to the suggestions put forward by D. Meadows's group of researchers, we can see that the results of the ecological balance calculation will require major changes in the economy, production and (most important) consumption as well as in the domain of social relations. In

order to rectify a social and economic life, the calculation of ecological state must be very plausible; therefore, it is natural that this calculation was (is and will be) always analysed strictly and subjected to severe criticism.

One of the most prominent and popular methods of modelling the ecological state in the world is the so-called "Ecological Footprint" (Ecological Footprint) calculation. Canadian ecologists – the authors of the "Ecological Footprint" method – propose to use a particular "common denominator" that is the territory to calculate an anthropogenic impact on the environment. The global Ecological Footprint can be measured by land plot needed to produce food consumed by people and materials, to absorb waste and locate infrastructure.

The global Ecological Footprint in 2001 was 13.5 billion global hectares (the "global hectare" is a theoretical formation – the hectare whose biological productivity corresponds to the average productivity of all biologically productive areas on earth in a given year) [1]. (Europe 2005. The Ecological Footprint. 2005). Meanwhile, the planet has 11.3 billion global hectares. So, man's "pressure on the environment" in 2001 exceeded its biological "capacity" by 21%.

"Viable economy". In the beginning (from the 1970s to the 1980s), the term "sustainable development" gained popularity; primarily it implied a harmonious relationship between human activity and nature – a balance between an impact of man's activity on the environment and its vital capacity. We have already discussed this topic earlier. However, nowadays the expression "sustainable development" is perceived as a more comprehensive concept. Apart from the idea of "bearable environment", there are two other elements "viable economy" and "equitable society".

If we regard the production of material products, the development of material well-being, a salary increase as "economy", then man was interested in them earlier than in the state of the environment. At the end of the 20th century, that interest was important in a sense that there was a strong belief that to get interested in one's own material well-being, which was individual for everyone or for each country separately, is not enough: seeking to undertake some activity one should refer to the global community, otherwise the world would encounter severe economic setbacks. In 1977, Robert S. McNamara, the President of the World Bank, proposed to establish the Commission on International Development and advised the International Monetary Fund and the World Bank to organise annual meetings. Willy Brandt, the leader of the Social Democratic Party of the Federal Republic of Germany, was appointed the first Chairman of the Commission on International Development. W. Brandt's Commission presented its first report in 1980. The Commission expressed concern about the fact that the world was under severe financial and economic crisis. The International

[1]Europe 2005. The Ecological Footprint. Retrieved from http://www.footprintnetwork.org/images/uploads/Europe_2005_Ecological_Footprint.pdf

Development Commission's forecasts soon came true: in 1982, Mexico became insolvent, and then Brazil, Argentina and other developing countries were faced with the financial crisis. A wave of a financial shock swept over the banks around the world. The recent setback is known to have affected the United States and European countries (Iceland, Greece, Spain, and so forth).

In examining the topic of sustainable development, the results of W. Brandt's Commission are interesting in two ways. The first is that the Commission put forward the idea that the economy might face something similar to what is happening in nature. The second is that the Commission's findings demonstrated an unequivocal relationship between an economic state of the world and its social sphere: the Commission on Development treated a huge economic backwardness of developing countries (in the southern part of the world) in comparison with more developed ones (in the northern hemisphere) as one of the factors leading global finances towards the crisis. Actually this backwardness has still been very vivid today. It can, for example, be illustrated by the data collected about the number of hungry people in the world: the largest part of them live in the Southern Hemisphere of Earth.

The title of the Report of the Commission on International Development "*North-South: A Programme for Survival*" indicates the extent to which this Commission treats the disparity between the developed North and backward South as imminent to the world economy.

Since the 1980s, researchers began to pay attention to the state of human relations in the world and in a separate country. Not only sociologists but also economic analysts began to take an interest in this issue. It might have been Japan's economic "challenge" that drew the latter interest. The Japanese economy at that time began to overtake the most developed countries in the world. The great success accompanied one industry after another: steel manufacturing, ship manufacturing, photo cameras, cars, electronics – everything developed rapidly in Japan and surprised American and European businessmen. It continued to last regardless of the fact that production in Japan in 1980 was more expensive than in the USA, and that Japanese spent nearly forty years reconstructing their country after World War II. Economic researchers, for example, R. Pascal, A. Athos and others, soon revealed the Japanese "mystery". It was rooted in the culture of human relations. In America, work was traditionally regarded as something that existed separately from the individual's life. It was not accepted that co-workers or the employer himself took care of a person's problems which he was faced with away from work. In Japan, on the contrary, the aim of management was to manage an entire complex of human needs – economic and social, psychological and spiritual. It is that culture of human interaction which united all the members of an organization into one whole, incentivized them to take a common interest in the activities of an organization and increased its productivity.

"Social capital". At any rate, society pays more attention to the state of the relationship between its members and evaluates it. One starts to talk about the idea of "social capital". "Social capital" implies cooperation between individuals and their willingness to work for the good of the community (enterprise, city, country). In fact, it is an asset as it increases the community's productivity (Imbrasaitė 2004).

The topic related to the social status at all levels (both in the world and in a separate country) became one of the main issues addressed at the 1996 World Summit which was held near Rio de Janeiro (Rio de Janeiro). Agenda 21, the Rio Declaration on Environment and Development, points to a growing divide between poor countries whose residents lack basic things such as food and proper medical care and rich countries in which an excessive and irrational use of natural resources has been entrenched. Agenda 21 also refers to the issue of the most vulnerable groups such as women, children, local inhabitants of less developed countries, and others.

Examining and comparing the state of various countries, we can easily notice that they have different levels of economic development; moreover, they use natural resources differently, as well.

Economically developed countries use more natural resources than their availability in the territories of these countries. For instance, in 2005, thirty three countries used natural resources two times more than their availability in the territory of these countries, while thirteen countries – more than three times. Those were the most developed countries. Hence their welfare depends not on their own biological capacity (see the previous information) but on biocapacity of the poorest countries. Industrial regions or even entire countries live by appropriating the capacities of a much larger territory than they physically occupy. Although their economy seems to be booming, in fact these countries are experiencing an enormous ecological deficit which is not indicated in their trade balances and current accounts.

How to meet the needs of the present and tomorrow?

The statement 'regulating economic and social development such that it can meet the needs of the present without compromising the ability of future generations to meet their own needs' must be defined more precisely by applying it to the development of the relationship between humans and the natural environment:

- Renewable resources must be used such that their quantity may not go below the threshold needed for regeneration.
- Not to hinder the cycle of natural resources during which they are replenished.
- In search of the possibilities to substitute the non-renewable natural capital for replenishable resources; one has to search for those resources which

can perform the same functions as non-renewable resources and are less vulnerable.

The cycle of interaction of three components (a harmonious relationship between natural, economic and social phenomena) closes. Human life (economic and social activities) exerts a huge load on the planet's natural environment. Both economic and social activities consume our nature and we should be more interested in its "health". Economic activity is related to the "social capital", in other words, a state of human interpersonal communication. We can draw the conclusion that one must envisage the totality of complex issues and tackle them rather than resolve the problems of each sphere separately and individually. It is exactly what the phrase "sustainable development" stands for nowadays.

5.10. Current European planning systems and challenges

Contemporary urban planning is an assumption of certain planning packages which "matured" step by step around the world. Urban planning emerged and continued to develop not at one time and in one place. Due to the Benevolo's History of the City", permanent settlements with primitive planning appear from the New Stone Age, about 10 000 years ago, when the mankind became sedentary, started to cultivate land and produced goods collectively (Benevolo 1980). The Ancient Greece cities are as the origin of planned civilized coexistence of democracy, beauty and limited growth for protection nature outside. The Roman, Medieval and Renaissance cities developed organically until industrial revolution. Massive increase of population in the nineteenth century Europe led to the great reconstructions of Paris, Madrid, Barcelona's cities plans. Outstanding idea of the Garden city responses to the industrial revolution challenges. Planned cities is not an invention of Europe, urban planning practice emerged in all parts of the world.

American planning process is unique contribution to the solution of disputes over competing demands for the use of private land at the beginning of XX century. It was designed to protect private property (in particular – owners of Single-family housing in the suburbs) from a new development. Initially, all development areas where divided into three zones: single-family residential, commercial and industrial. Later, after World War II, the growth of the economy facilitated a need for more diversified real estate development. In the zoning plans appear multi functionality and residential houses concept. This corresponds to the discussions about planning in society and among professionals. For this issue in the municipalities appear Planning Commissions. Due to the lack of clear evaluation criteria, public debates often end in the courts. Fierce debates between supporters of the conservative and modern Zoning representatives very often turned into scandals. To withstand arguments, urban planners

founded associations (Babcock 1996). However, progress of the zoning plans has been carried out on the number, but not the results achieved. Without assurance of their efficiency, zoning plans have been installed across America, and later the world. It somehow explains why great American urban thinkers Lewis Mumford and Jane Jacobs writes so many books on planning process, planners and urban changes in the twenties century.

Famous Swiss architect Le Corbuzier was the ideologist and practitioner of modern urbanism Modern urban planning principles were declared in the Athens Charter, produsedin 1933 by Congrès International d'Architecture Moderne (CIAM). The Charter had a huge impact on urban planning after World War II (http://en.wikipedia.org/wiki/Athens_Charter). Modernists argued that residential areas should be separated from the industry – less pollution and more greenery. Developing this idea urban life was sorted into 3 activities, had to be dealt on its own, connected by the streets network – life, work and rest. Modernists put a little attention to the existing urban situation and heritage, considered unnecessary decoration of buildings, the significance of street as social arena decrease (streets became roads). New multistory housing buildings where scattered in the suburbs. Modernistic style city Brazil, built by Architects Oscar Niemeyer and Roberto Burle Marx is sampler of Athens Charter implementation. Brazil was built in 41 months, from 1956 to April 21, 1960, when it was officially inaugurated (http://en.wikipedia.org/wiki/Bras%C3%ADlia).

Short prehistory shows that urban planning constantly evolves and adapts to the changes in social economical life, but consequences remain and sometimes becomes a challenge. Contemporary urban planning is post modernistic, strongly supported by sustainable development ideology. Global world became urban, more than 50% of population lives in the urban areas, Europe is even more urbanized. The Mumford, L. in his book "The city in the history", states that while the city in the past was its own world, today's world become a city (Mumford 1961). Cities are managed by municipalities. All over the world the municipalities lack of finances, technical expertise, sometimes land, sometimes political will are all invoked as reason of preventing implementation. Private sector, developers have a huge responsibility for undergoing changes of existing cities. As a strong interest group they must be familiar with urban policies, processes and plans (Ryser, Franchini 2008).

Current European planning systems

Current urban planning in Europe reflects the evolution of planning tools and modification as a result of globalization and EU enlargement. Urban planning more and more is an international activity, attracting high market competition, requiring knowledge, understanding of global trends, best practices. Existing urban planning culture in different countries is different, correlated to the existing administrative and legal system, urbanization traditions. For sampler, in Sweden

and other Scandinavian countries planning is based on a large consensus and reluctant to large changes; Germany has a strong regulatory system. The need for changes in formal planning led to implementation of new methods and processes; in Netherlands planning is more visionary and highly conceptual. After the new Spatial planning Act implemented in 2008, it became less slow; in Switzerland planning lost its comprehensiveness and perceived very positive as an option for solving local, short term problems. Public participation occupies a greater role despite fears of delays and contributes to decentralized, polycentric settlement strategy (EU compendium of spatial planning systems and policies 1999). Eastern and Central European countries are experiencing transition processes from a centralized to a market and democracy conditions, planning traditions still emerging (insufficient attention to the public interest and public participation, monitoring on changes and explosion of urban areas to the suburbs, panders to commercial development purposes, etc.) (Ryser, Franchini 2008).

According to the existing planning traditions in Europe there are 5 types of planning systems: 1) comprehensive integrated approach; 2) efficient land use management; 3) regional economic planning: 4) urbanization tradition 5) Eastern European transition processes (Figure 5.2).

Comprihensive integrated planning documents assess the economic, social and ecological aspects, they form the basis for sustainable development in areas. In Europe there is no uniform planning culture, different countries have their own planning agreed upon existing legal system, the responsibility of local government, codification to EU policies, directives, based on the principles of subsidiarity, coherence and mutual influence. It could be stated some common features :

- all planning systems can distinguish in two levels of planning: the state (including the regions) and municipalities. Each planning level has a specific task of planning and responsible for planning administration; to organize preparation of documents within their competence for the development and implementation; set a legal consequences of documents for the legal entities and individuals; two type of spatial/urban plans are required to be produced: comprehensive master plan and detailed plan (Figure 5.2).
- land use planning monopoly is transferred to municipalities. They are responsible for the preparation of complex spatial plans for the entire territory and smaller areas; need to monitor the implementation. Municipalities are responsible for the planning services and have at least one political committee, responsible for spatial planning and construction. If necessary, for the resolution of current challenges municipalities cooperate, draw up joint plans.

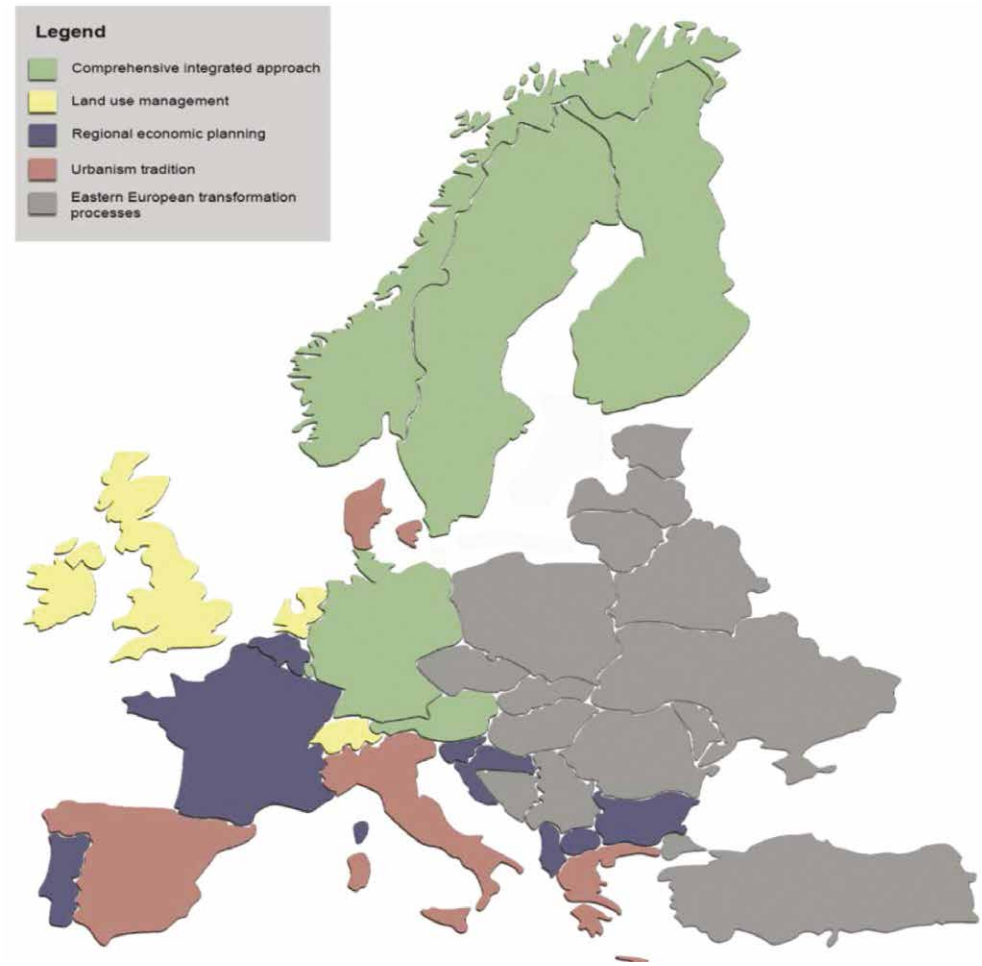

Figure 5.2. Planning in Europe
Source: EU compendium of spatial planning systems and policies, 1999

– the application of the principle of compatibility ensure implementation of a public interest from planning documents established by the municipal plans, state as well as region;
– the application of the principle of mutual influence, ensure municipalities participation in the development of higher-level plans; in local plans they have to take into account national plans, policies. If the municipal plans do not provide such a requirements, national authorities may recommend not to validate municipal plans or cancel them;
– building permit associated with detailed plans. If there are no prepared detailed plans, municipalities may also issue a permit, but to complain is possible if the permission was given and later postponed;

– municipalities has right to make a contract with a developers for the development of infrastructure in areas which, according to a comprehensive plan are provided for urbanization or to be converted, where the municipality cannot provide. All agreements must be open for public, indicate input of the state or municipal participation in the development of infrastructure;
– environmental, social and economic dimensions of sustainable development needs to be considered in comprehensive way;
– planning process should be open to public; National supervisors have the right to cancel the approval of municipal plans when they prepared not in line with the open process and procedures. Public has right to access to information, to be consulted and to participate in the plan approval process;
– many countries has clear identified quality standards, as the public interest for environment, land, water and forests.

Urban Policy in European Union

European Union countries regulate urban planning, in comply with the EU urban policy guidelines formulated in below mentioned documents.

Charter of European Cities & Towns Sustainability 1994. (Aalborg charter 1994) *Source*: http://ec.europa.eu/environment/urban/pdf/aalborg_charter.pdf)**.** Approved by the participants at the European Conference on Sustainable Cities &Towns in Aalborg, Denmark on 27 May 1994. Initially Charter was signed by more than 200 cities. Charter consist of 3 parts:

Part I: *Consensus Declaration*: European Cities & Towns Towards Sustainability (Cities & towns express their notions and understanding that the idea of sustainable development helps to base standard of living on the carrying capacity of nature, to achieve social justice. All towns and cities are committed to sustainable development direction and recognize that cannot permit it to export problems into the larger environment or to the future. Agree upon sustainable economies and environmental sustainability, common strategies and public investment priorities, etc.

Part II: *The European Sustainable Cities & Towns Campaign.* Signatories of this charter, decided to move forward together towards sustainability in a process of learning from experience and successful local examples. They will encourage each other to establish long-term local action plans (Local Agendas 21), thereby strengthening inter-authority co-operation, and relating this process to the European Union's actions in the field of the urban environment. Initiate The European Sustainable Cities & Towns Campaign to encourage and support cities and towns in working towards sustainability.

Part III: *Engaging in Local Agenda 21 Processes: Local Action Plans Towards Sustainability*. Explain the need to review whether the internal arrangements of our local authorities are appropriate and efficient to allow the development

of the Local Agenda 21 processes, including long-term local action plans towards sustainability.

The European Spatial Development Perspective, 1999 (*source*: http://ec.europa.eu/regional_policy/sources/docoffic/official/reports/pdf/sum_en.pdf). The charter aimed the cohesion of sectoral and spatial strategies, action plans. The three-dimensional guidelines: polycentric and balanced urban system development, partnerships between urban and rural areas, developing new urban-rural relations; integrated transport and communications concepts which support the polycentric development of the territory of the EU and ensure access to infrastructure and knowledge; wise management of natural and cultural heritage, which helps to preserve regional identity and cultural diversity in the face of globalization.

The European Commission's Third Cohesion Report Cohesion 2004. (*source*://ec.europa.eu/regional_policy/sources/docoffic/official/reports/cohesion3/cohesion3_en.htm). Indicates that the spatial vision should be aware of the city and urbanized region's role as cities in Europe is more than the production site, they are the places where the people are working and living. It is important to increase the EU's territorial cohesion, and preserves the local diversity and identity.

The Lisbon strategy, Cities and Lisbon agenda 2006 (source: http://en.wikipedia.org/wiki/Lisbon_Strategy). Strategy emphasizes on the role of European cities in the creation of knowledge economy and society for the strengthening of national competitiveness.

European Urban Charter II 2008 (*source*: https://wcd.coe.int/wcd/ViewDoc.jsp?id=1279015&Site=COE). Charter highlights the role of society in creating a sustainable environment. Urban Charter – recommendations based on a common European urban experience and behavior with cities and towns sets rules for urban ethical. Take into account the change in the situation, those in recent years some cities, basically without worrying about the high quality of architecture and urban landscape and suburban growth, sacrificing cities to unhuman, commercial purposes. The principles of urban problems: de-industrialization of entire neighborhoods, population aging, social exclusion and scattered development (urban explosion), increased use of cars, etc. Existing urban models, accompanied by urban sprawl, characterized by functional specialization of areas (separated by residential, commercial, recreational and industrial functions) – drastically reduces the environmental capital, increases energy consumption – a policy without a future (Modernist planning consequence from the middle of the twentieth century). Future cities have to imagine how dense, compact urban forms could sustain with a little resource as possible and give residents more access to the services created and natural heritage sites. Need to find an alternative to own a car: hiking, cycling or public transport. Charter sets out the underlying

problems and how to apply the principles of sustainable development. Cities are the driving force for the development and welfare of the people and a unique public asset we inherited.

Leipzig Charter on Sustainable European Cities 2007 (*source*: http://www.eu2007.de/en/News/download_docs/Mai/0524-AN/075DokumentLeipzigCharta.pdf). The Leipzig charter is a substance of the integrated urban development goals and targets (Figure 5.3): the creation of high-quality public spaces, careful housing policy, the renovation of deprived urban areas, public transport emphasizes, the role of the city and local government, capacity building for integrated urban policy, including the PPP. Named a new financial instrument Jessica for the development of integrated urban development funds, activating private capital into the implementation of integrated urban strategies.

Figure 5.3. Leipzig Charter on Sustainable European Cities objectives
Source: European Investment Bank, 2010

European Parliament and European Council Regulation on the application of the Aarhus Convention (*source*: http://merlin.obs.coe.int/iris/2006/9/article110.en.html) . It declare that society and individuals have the right to:

– access to information;

– to participate in decision-making;
– access to Justice.

The public must be informed about the project proposals, when they are in: on the environment or environmental assessments; practical arrangements for participation in the preparation of plans and programs. The administrative entities must be specified to provide for public information and to give possibility to submit comments, opinions or ask questions; to know the terms of the process and to have enough time to participate in the process (for sampler: For comment on must be at least 8 weeks to consider the draft prepared for at least 4 weeks). In exceptional cases, the period may be shortened. The state must ensure the rights of public organizations; regulate omissions; ensure the quality of the information and provide knowledge in the field of health; establish procedures for the public to participate in the development of the plans associated with environment and programs related to the environment policies; promote the use of information through telecommunications, e technologies. Registered non-governmental public organizations and operating for at least two years have the right to access to justice and defend public interest.

5.11. Urban challenges in the countries of transition

European Eastern transformation countries are undergoing transition process from centralized, socialistic planning to the planning under the market and democracy conditions. Nevertheless, some relicts of centralized planning still exist in the urban patterns and mind sets. It limits achievements for sustainable development. In the context of rapid changes, the understanding of principles of former planning system could help speedup transition process and find better everyday solutions.

In soviet time (1945–1990) spatial planning doctrine consisted on aspiration to concentrated population in compact rural or urban settlements and create massive land complex for agriculture. The purpose of agro complex was to destroy the old farmsteads and villages dispersion. In soviet times, the sphere of urban planning which includes complex economic, social and land use issues have been referred to as the general planning. Basically the centralized planning principles were similar to the master planning existing in Western countries; from the point of complexity the system has been advanced, planning documents for all settlements where done (Raagma 2009).

In centralized planning system the planning and implementation was strongly controlled by state decisions and allocation of resources. Despite the abundance of plans, limited resources prevent implementation. In the second half of XX century soviet cities and rural settlements were planned following Athens Charter (modernistic planning declaration), where working, living and leisure functions

were separated. A lot of reconstruction of the historical centers of cities was foreseen, but due to the lack of resources, not all of those plans have been implemented. A lot of valuable historic heritage was inherited and provides possibilities for further development of urban identity and aesthetics, stays an important object for citizens, tourists, local business and developers.

Centralized planning was supported by the state land ownership and strong building control, served for the allocation of resources necessary for deliver jobs, housing, infrastructure and services. Priority was given to the distribution of the jobs and workers. Housing and services were located near large industrial or agricultural complexes in order to optimize journeys to work and services. Unified planning regulations and standards for all soviet country lay down the parameters for living space and necessary territories, infrastructure and services required for 1000 inhabitants, etc.

Figure 5.4. The samplers of urban sprawl around Lithuanian cities Vilnius and Klaipeda
Source: photos by D. Bardauskiene, maps made by the State Register centre, 2009

Current land use planning is a task for municipalities, but the municipal master plans very often do not meet the socio-economic reality, they planned too much new areas for development. This facilitates chaotic suburbanization (Figure 5.4). Low density mono functional developments in the suburbs are known as the urban sprawl" phenomenon, recognized as one of the greatest challenges in all European countries. Sprawl around cities well illustrates the bottleneck of urbanization. Urban sprawl phenomena have long history. Refer to the contemporary situation we need to have in mind the suburbs that have grown after the Second World War in many European countries (ISOCARP REVIEW 2009).

In Easter transformation countries planning became flexible, private sector is playing a mutual role. Soviet planning system no longer exists, but a new system, new regulations and planning documents are under development. Many developments are going without a clear strategy – master planning, by the proposals of local detailed plans. For the sake of the public interest, the public sector has a hard task to protect the compactness of shrinking cities. One of the important solutions is renovation of huge arrays of modernistic style housing and add of a new functions in to the sleeping districts became the main challenge for the XXI century.

Soviet general plans were secret, they were not known by the public. Current system has enabled the public to participate in creating the future of their cities and places they live. EU urban policy documents, national laws, regulations found the public's rights and obligations for planning administrations to make an open public participation process and set deadlines for procedures. Nevertheless, public participations is more formal procedure.

Public infrastructure is a public responsibility, but the land and working places, services and housing development are mostly private business. Due to the needs of private sectors new constructions in cities are going in the different directions *(leaping frog syndrome)* and causes the rise in prices for public infrastructure. How to share the burden of infrastructure, transparent charge developers for the public infrastructure still no one good solution.

Sustainability as one of the essential properties of territorial development, it implies a stability, predictability and certainty. Unfortunately, to date, the majority of towns are faced with the problems caused by unsustainable development of urban areas. Very often as a result of construction projects the needs of the respective territory's energy are not considered and commissioning of a large object leads to a shortage of facilities for the construction and operation of buildings and other structures. Often in the course of construction attention to the relevant social infrastructure is not given, and the population of the new district is forced to use the services of hospitals, schools, kindergartens, located at a considerable distance from the residence.

The unpredictability in the territorial planning entails an errors in the assessment of market values of properties. Each property is unique, and its evaluation is influenced by a range of factors, one of which is the location of the object. For example, citizens can buy an apartment, guided by the fact that in the immediate vicinity of the house is a green space where they can relax, take a walk with children. However, in many cases, plans can't guarantee that a year or two later at the site will not be built a multi-storey building and buyers of the apartments will cease the quality of life on which the decision to purchase was made (http://www.lawmix.ru/comm/321/).

Some democratic European countries have achieved good practice in urban development. For example planning system in Denmark is curbing urban sprawl associated with second home construction and protection of nature, especially in coastal areas. In order to compete with rural areas for sustaining people in the cities, municipalities improved the quality of life. Copenhagen is known in the world as a winner of "European Green Capital" in 2014 (http://ec.europa.eu/environment/europeangreencapital/winning-cities/2014-copenhagen/index.html). From cycling to harbor bathing, resource efficiency to green mobility and not least the transition of a European capital to be CO_2 neutral in 2025 – Copenhagen will be one big workshop and display case for the modern era (http://denmark.dk/en/green-living/copenhagen/green-capital/).

In concluding, could be stated, history exists in architecture of buildings, streets, open spaces and urban landscapes as well as in the mind sets of citizens. It associated not only with the excellence of architects and developers, but with existed urban policies, morality, economical, ecological and social issues. The brief studies on the near history of the city's planning help us to understand what is the role of planning was and how it deals with future. Environment, ecology and sustainable development are in the visions for many European countries. It brings a new culture of planning and implementation in the era of post industrial economy and knowledge society. The current debate in many European cities is going around the future without cars: "If the 20th-century approach to solving a mobility problem, just like solving a housing problem, was to build some roads or add some rail, in the 21st century we have to adopt a non-building approach, optimizing the existing built-fabric we have" (Stephen Moss).

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VI. DECISION SUPPORT SYSTEMS FOR REAL ESTATE DEVELOPMENT

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6.1. Introduction to decision support systems

There are various classifications of decision support systems (DSS). This Chapter is based on the traditional DSS classification, according to which DSS are sorted out into decision support systems, group decision support systems, expert systems and neural networks. All the systems taken together get into the artificial intelligence sphere. These systems are analysed in detail in this Chapter.

Decision support systems, by definition, should aid in and strengthen some kind of decision process. Decision support systems are computer-based systems that bring together information from a variety of sources, assist in the organization and analysis of information, and facilitate the evaluation of assumptions underlying the use of specific models.

The decision support system should comprise of the following four major constituent parts. These parts are: a data (database and its management system), models (model base and its management system), a user interface and a message management system.

There are several interpretations of databases (DB). The first DB is an aggregate of the interrelated and jointly stored data, i.e. information objects intended for computer processing. The concept of the second DB is wider and identifies DB with the data and a set of software that process the same data.

Database Management Systems (DBMS) are developed for defining, creating, maintaining, controlling, managing and using databases. Special software is required for enabling the user to operate and communicate with databases. The database management system provides access to data as well as to all the control software necessary to receive data in the form that is appropriate for an object under consideration to be analyzed without too much effort from the user. The major functions of the Database Management System are as follows: designing of the database's structure; enlargement, collection and editing of the database; maintenance, search, sorting and other handling of data.

Some people view databases as being more or less independent systems and databanks, i.e. treating databanks as a system of information, mathematics, linguistics, organizational, software and hardware facilities. Software facilities evaluate the data stored in the technological process intended for the data's

collection on a centralized basis with the aim of obtaining the immediately required information with the staff's participation.

The model-base management system performs a similar task for models in the DSS. It keeps track of all the possible models that might be run during the analysis, as well as controls for running the models. The model-base management system also links between models so that the output of one model can be input into another model.

The user interface represents all the mechanisms whereby information is input into the system and is output from the system. The system includes all the input and screens by which users can request data, models and output screens and through which users can obtain their results.

The message management system allows for the use of electronic mail as another source of providing data.

DSS provides a framework through which decision-makers can obtain the necessary assistance for a decision through an easy-to-use menu or command system. Generally, a DSS will provide help in formulating alternatives, accessing data, developing models and interpreting their results, selecting options, or analyzing the impacts of a selection.

The decision support system can include many models. These models can exist both inside and outside the DSS. The following three dimensions define the models: representation, time dimension and methodology.

Accordingly, the representation models can be divided further into quantitative and qualitative ones. The qualitative (i.e. expert and multiple criteria) models are based on judgments, subjective estimates, opinions and the expert's evaluations. When different experts evaluate the same qualitative characteristics of the same option, they often get different results. This can be explained by the different experiences, educational background, goals and available tools, etc. that may be used. The achieved results can be made more objective by applying expert evaluation methods.

The quantitative models (i.e. statistics and accounting) represent objective features of the options, irrespective of the expert's subjective evaluations and judgments. Objective features are represented directly by physical measurement units such as monetary units, kilograms, meters, degrees, percents and ratios, etc.

Both quantitative and qualitative models have their advantages and drawbacks. The quantitative models represent their options in an objective way, but usually not thoroughly and comprehensively enough. On the contrary, the qualitative models represent reality subjectively, and more thoroughly and comprehensively. Therefore, the application of quantitative or qualitative methods usually depends on the concrete decision-making situation. Very often a complex method of application of both quantitative and qualitative methods should be applied when making a decision.

Time dimension models are divided into static and dynamic ones. The static models support the position that feature the options, in the course of time that do not change, whereas the dynamic models take into consideration the changing nature of the options also in the course of time.

The methodology addresses how the data will be collected and processed. According to the traditional classification, there are five general methodologies: complete numeration, algorithmic, heuristic, simulations and analytical ones.

When applying the complete numeration method we collect and evaluate information about all the feasible options. This method is highly time-consuming, costly, often impractical and is used for example when conducting a general census. In combination with neural networks it can also be applied with the aim of identifying stolen credit cards. For example, people who use credit cards usually buy typical products or pay for typical services. However, when credit cards start being used for buying other products at unusual prices or for unusual services, then on the basis of the complete numeration method and through neural networks we can detect the moment when a particular credit card was stolen and terminate its validity. Very often the system of neural networks enables the detecting of a credit card's theft before its owner becomes aware of it having been stolen.

The algorithmic models are best represented by operations research methods and are applied when counting from the beginning till the end (i.e. from the moment of the initial data's entering until the gaining of the wanted results or goals). Differently total enumeration, an algorithm models identify the best outcome without first evaluating all possible alternatives. On the basis of these models when carrying out a repeated calculation, we can determine the best values of concrete characteristics of the options (e.g. an objective function) by taking time, financial, technical and other constraints as simulation parameters. These repetitive calculations are simple arithmetic operations.

The heuristic models are applied for settling problems that cannot be solved algorithmically. All heuristic models involve searching, evaluating and finding a good solution. The heuristic models help to diminish the number of search options and aim at providing a solution and other findings. Heuristics is the most important part of the artificial intelligence and expert systems.

Simulation settles problems that cannot be accurately and precisely examined on the basis of a mathematical analysis. When applying these models we can create an adequate and typical situation of the options. Simulation models simplify the relationships and interdependencies of the alternatives being considered and provide information about conditions from which can be find a rational solution. Repeating the possible states of the option provides the possibility to experiment and reveals ways of improving the system's functioning. Such a method

of simulation is often used when examining problems related to storage and the servicing of reserves, the demand for products, raw materials arrivals.

At the beginning of the analytical modeling, a general analysis of the option is carried out. Thereafter, the option is divided into separate parts for their examination. Later we have to determine the relations and dependencies of the elements that comprise of the option. A statistical analysis serves as a perfect example of analytical modeling.

Among the branches of artificial intelligence systems are expert systems. Expert system is a computer program or set of computer programs that contains a knowledge base and a set of rules that infer new facts from the knowledge and from the incoming data and are used to help solve problems in certain areas. Moreover the system performs many secondary functions, as an expert does, such as asking relevant questions, explaining its reasons and the like. The degree of problem solving is based on the quality of the data and the rules. Expert systems today generally serve to relieve a 'human' professional of some difficult but clearly formulated tasks. They are comprised of a knowledge basis with a set of rules and a mechanism of the presentation of findings and recommendations. On the basis of initial data and sets of rules, the expert systems identify situations, give diagnoses, formulate decisions and recommend actions. The expert system usually deals with tasks that usually require an expert's examination (simulation of the work of experts or consultants). Besides, just like an expert it performs quite a lot of auxiliary functions, e.g. asking of questions, explanation of its own reasoning, processing of symbolic expressions and substantiation of findings, etc. Modern expert systems usually help to liberate a professional from solving certain difficult but clearly formulated tasks.

Certain components are common to most expert systems e.g. a user interface, a knowledge base, a knowledge acquisition facility and an interference mechanism. The user interface is software that is provided for the exchange of communication between the system's user and the system. The knowledge base contains expert levels of knowledge on a particular subject. This knowledge is obtained from one or more 'human' experts as sets of rules, tables of data and is stored in a knowledge representational form that is inherent to the expert system's design. Expert systems are often referred to as knowledge-based systems because they always include a knowledge database. The knowledge acquisition facility is software that provides a dialogue between the expert system and the human experts for the purpose of acquiring knowledge from the human experts. This facility places the acquired knowledge onto the system's database. The inference mechanism (inference engine) interacts with the user and processes the results from the rules and the data in the knowledge base.

Neural network is a method of computing that tries to copy the way the human brain works. A group of processing elements receives data at the same

time and links are made between the elements, as repeated patterns are recognized. Many various-purpose neural networks can be found on the Internet. For example, solimar.net that uses a Solimar Valuation Technology is an intelligent, neural network valuation technology that powers collateral valuation products. It uses a continuously updated nationwide data store to gather specific data on the subject property and then estimates the value of properties in real time, based on comparable sales data.

Group decision support systems (GDSS) include communication, analysis and decision-making technologies that make it easier for a group of people to define unstructured problems and to make decisions. The purpose of GDSS is to improve the group decision-making process by eliminating common communication barriers and by introducing structural decision analysis techniques and to systematically analyze the form, timeframe and content of a discussion. The GDSS consist of communication technologies, computer technologies, and decision support technologies.

6.2. Decision support systems for the analysis of real estate development and their constituent parts

Many decision support systems for the analysis of real estate development and the constituent parts of the process in question have been developed worldwide:

- BIM-based decision-support system for master planning of sustainable large-scale developments (Kim *et al.* 2015).
- Geographic information systems (GIS)-based decision support tool to quantitatively assess land-use suitability for site redevelopment in urban renewal areas (Wang *et al.* 2013).
- Decision modeling in support of foreclosed housing redevelopment (Johnson *et al.* 2012).
- Decision support for the development planning of a theme park (Ren-Jye Dzeng, Lee 2007).
- Decision-making model in progress management of urban development (Li *et al.* 2009).
- Integrated approach using fuzzy real options, multicriteria analysis, and conflict analysis for a brownfield redevelopment (Wang *et al.* 2015).
- Strategic classification support system for brownfield redevelopment (Chen *et al.* 2009).
- Multi-criteria decision aids for management of complex knowledge in planning for sustainable development (Kain, Söderberg 2008).
- Logistic regression analysis on office development applications in urban Kowloon, Hong Kong (Tang, Choy 2000).

- GIS-based decision support system for brownfield redevelopment (Thomas 2002).
- Knowledge-based decision support system for measuring the performance of government real estate investment (Wang 2005).
- Group decision support for public policy planning (Groenendaal 2003).
- Public participation in a spatial decision support system for public housing (Barton *et al.* 2005).
- Refurbishment decision support tools (Ferreira *et al.* 2013a, b).
- Value based building renovation tool for decision-making and evaluation (Jensen, Maslesa 2015).
- A computer-aided decision support system for assessing a contractor's competitiveness (Shen *et al.* 2003).
- Group decision support system for value management studies in the construction industry (Shen, Chung 2002).
- The fuzzy GA-based multi-objective financial decision support model for Chinese state-owned construction firms (Lam *et al.* 2009).
- Web-based visualization platform for a spatial planning practice (Hayek *et al.* 2015).
- Information system in support of landscape assessment (Cudlip *et al.* 1999).
- Spatial decision support for strategic environmental assessment of land use plans (Geneletti *et al.* 2007).
- Real-time integrated communication system to monitor the progress and quality of construction works (Leung *et al.* 2008).
- Geographic information system that enables a spatial distribution analysis of urban industrial real estate asset values (Ming, Hin 2006).
- Information and communication technology in the real estate industry (Kummerow, Lun 2005).
- Heterogeneous multi-criteria multi-expert decision-support system for scoring combinations of flood mitigation and recovery options (Zagonari, Rossi 2013).
- Location query system for selecting the optimum living environment (Rau and Cheng 2013).
- Decision support tools for land-use decisions between greenfields and brownfields (Bartke, Schwarze 2015).
- Decision support tool for the positioning and sizing of vortex flow controls in existing sewer systems (Newton *et al.* 2014).
- A group decision support system for implementing value management methodology in construction briefing (Luo *et al.* 2011).
- Landslide susceptibility mapping using GIS (Pradhan 2013).
- Web tool to support decision making in the housing market using hesitant fuzzy linguistic term sets (Montes *et al.* 2015).

- Environmental decision support system for spatial assessment and selective remediation (Stewart, Purucker 2011).
- Inside banks' information and control systems (Eastburn, Boland 2015).
- Intelligent agent-assisted decision support system for family financial planning (Gao *et al.* 2007).
- Geographic information systems in real estate (Fletcher 2003).
- Multicriteria decision support system for housing evaluation (Natividade-Jesus *et al.* 2007).
- GIS-based decision support system for hotel room rate estimation and temporal price prediction (Kisilevich 2013).
- Ontology-driven decision support system for land delivery in Zambia (Abanda *et al.* 2011).
- Integration of environmental interests in urban planning through 'decision windows' (Stigt *et al.* 2013).
- An expert opinion system to evaluate environmental sanitation in the Algarve region (Canavese *et al.* 2014).
- Spatial decision support systems (Li *et al.* 2004).
- Credit risk evaluation model development using support vector based classifiers (Danenas *et al.* 2011).
- Bank loan approval decision support system from multiple perspectives (Majeske, Lauer 2013).
- Modelling property management decisions using 'iconCUR' (Langston, Smith 2012).
- Environmental decision support tools (Gluch, Baumann 2004).
- Evaluating the system intelligence of the intelligent building systems (Wong *et al.* 2008).
- Group support system for improving value management studies in construction (Shen *et al.* 2004).
- A fuzzy multi-criteria decision making approach to assess building energy performance (Kabak *et al.* 2014).
- Coastal risk management Decision Support Systems (Kane *et al.* 2014).
- Decision support system for real estate investment portfolio management (Trippi 1989).
- User-oriented recommendation system for real estate websites (Yuan *et al.* 2013).
- Multi-agent systems (Diappi, Bolchi 2008).
- Real estate confidence index based on Web GIS and SPSS WebAPP (Guo *et al.* 2007).

The following is a short description of some of the decision support systems for the analysis of real estate development and the constituent parts of the process in question.

The development of large-scale projects has comprehensive effects on economic, social, and environmental sustainability. These effects are closely related to the time of the development. The evaluation of various time-dependent metrics for multiple development scenarios supports stakeholders in making informed decisions for their master plans. However, current practice lacks an integrated methodology that enables automatic evaluation of the metrics and visualization of the evaluation results, making the master planning process arduous. The existing Building Information Model (BIM)-based decision-support methods have been used to create alternatives rapidly, evaluate multiple metrics, and visualize alternative plans prior to actual construction; however, those methods have primarily focused on building design and construction. Therefore, they are limited in their ability to provide an appropriate methodology for master planning of large-scale development projects (Kim *et al.* 2015). Kim *et al.* (2015) introduce the Development Strategy Formulation and Evaluation Methodology (DSFEM), which is tailored for the master plans of large-scale developments. Based on this methodology, Kim *et al.* (2015) developed the Development Strategy Simulator (DSS), an automated and integrated decision-support system. Kim *et al.* (2015) applied the DSFEM and DSS to the Qatar Economic Zone (QEZ) project as a case study. The application results demonstrate that the DSFEM and DSS allow for automatic and integrated evaluation and visualization of development scenarios and their metrics, supporting multiple stakeholders in making timely and informed decisions (Kim *et al.* 2015).

Urban renewal is a significant issue in developed urban areas, with a particular problem for urban planners being redevelopment of land to meet demand whilst ensuring compatibility with existing land use (Wang *et al.* 2013). Wang *et al.* (2013) present a geographic information systems (GIS)-based decision support tool (called LUDS) to quantitatively assess land-use suitability for site redevelopment in urban renewal areas. This consists of a model for the suitability analysis and an affiliated land-information database for residential, commercial, industrial, G/I/C (government/institution/community) and open space land uses. Development has occurred with support from interviews with industry experts, focus group meetings and an experimental trial, combined with several advanced techniques and tools, including GIS data processing and spatial analysis, multi-criterion analysis, as well as the AHP method for constructing the model and database. As demonstrated in the trial, LUDS assists planners in making land-use decisions and supports the planning process in assessing urban land-use suitability for site redevelopment. Moreover, it facilitates public consultation (participatory planning) by providing stakeholders with an explicit understanding of planners' views (Wang *et al.* 2013).

Johnson *et al.* (2012) describe and develop a model for calculating location-based strategic values of foreclosed properties considered for acquisition and

redevelopment by community development corporations (CDCs). A property's strategic value refers to its proximity to site-specific neighborhood amenities and disamenities (e.g. schools, public transit, distressed properties), given the relative importance of that proximity to CDC organizational and community objectives. Johnson *et al.* (2012) operationalize the concept of strategic value, and apply this concept to a salient public sector decision problem. Using data and value assessments from a CDC engaged in foreclosed housing redevelopment, Johnson *et al.* (2012) compute measures of strategic value for a set of acquisition candidates. Johnson *et al.* (2012) show that strategic values can differ in systematic ways depending on the types of amenities and disamenities identified as relevant for CDC acquisition decisions, the relative importance assigned to those amenities and disamenities, and the utility maximization objectives of the CDC. Johnson *et al.* (2012) conclude by proposing a multi-criteria decision model for foreclosed housing acquisition and redevelopment which incorporates a theory of residential housing impacts for which strategic value measures are a special case.

The development of a large theme park usually includes multiple phases. The combination and development ordering of facilities in these phases have a great impact on the attractiveness of the theme park. Examples of such facilities are attractions, food service, accommodation, and supporting facilities. Some of these facilities although highly profitable, cannot attract visitors on their own, while others may boost the visitor count, yet by themselves do not make a profit (Ren-Jye Dzeng, Lee 2007). Ren-Jye Dzeng and Lee (2007) considers the values that each development activity brings to the project, and prioritizes feasible alternatives based on their net present values. Based on the integration of simulation and the genetic algorithm, a decision support system has been developed to determine the combination and ordering of facilities, and the resources needed for each development step. This development plan will provide investors with systematic and quantitative information that will help them to determine the development portfolio of each facility under the constraint of the funding program (Ren-Jye Dzeng, Lee 2007).

Schedule arrangement is a key to success in urban development. In conventional practice, however, schedule arrangement in urban development is merely taken into account at the conceptual level (Li *et al.* 2009). Li *et al.* (2009) study efficiently and effectively investigates and discusses the urban planning process based on the theory of systems engineering by an integral approach of quality and quantity, theory and practice, and government and market views. Support from specialist and financial model analysis also plays dominant roles in urban planning process. Furthermore, based on the outputs of models and experiences from a number of different urban planning projects, a decision-making model created by Da Yue Consulting Co., Ltd (DYCCL) has been applied in consulting project in Huainan of Anhui province (Li *et al.* 2009).

Wang *et al.* (2015) propose a risky project negotiation framework, comprising fuzzy real options, ordered weighted averaging (OWA), and the graph model of conflict resolution (GMCR). Fuzzy real options analysis is employed to evaluate risky projects where the value of managerial flexibility cannot be overlooked. For civil engineering project evaluation, OWA is used to estimate the parameters of the fuzzy real options model, such as initial values and volatilities, to reflect the risk preference of decision makers (DMs). Because it can take into account DMs' values and preferences for a risky project, GMCR is utilized to identify equilibria, or potential resolutions of the conflict, among all possible states, or combinations of DMs' choices. While an option pricing model is employed to estimate the values of decision makers (DMs) toward a risky project, all parts are integrated via fuzzy functions in this framework. A brownfield redevelopment case, the Ralgreen Community in Kitchener, Ontario, Canada, is used as a typical risky project to demonstrate how to apply this integrated approach (Wang *et al.* 2015). The main contribution of Wang *et al.* (2015) is to demonstrate the comprehensive use of fuzzy methods to assess brownfield projects. For this purpose, stochastic methods face difficulties because risks cannot be fully reflected in market prices. Expert knowledge that is descriptive, multi-attribute, or subjective in nature can be effectively quantified using fuzzy representations (Wang *et al.* 2015).

Brownfield redevelopment (BR) is an ongoing issue for governments, communities, and consultants around the world. It is also an increasingly popular research topic in several academic fields. Strategic decision support that is now available for BR is surveyed and assessed. Then a dominance-based rough-set approach is developed and used to classify cities facing BR issues according to the level of two characteristics, BR effectiveness and BR future needs. The data for the classification are based on the widely available results of a survey of US cities. The unique features of the method are its reduced requirement for preference information, its ability to handle missing information effectively, and the easily understood linguistic decision rules that it generates, based on a training classification provided by experts. The resulting classification should be a valuable aid to cities and governments as they plan their BR projects and budgets (Chen *et al.* 2009).

The vision of sustainable development entails new and complex planning situations, confronting local policy makers with changing political conditions, different content in decision making and planning and new working methods. Moreover, the call for sustainable development has been a major driving force towards an increasingly multi-stakeholder planning system. This situation requires competence in working in, and managing, groups of actors, including not only experts and project owners but also other categories of stakeholders. Among other qualities, such competence requires a working strategy aimed at

integrating various, and sometimes incommensurable, forms of knowledge to construct a relevant and valid knowledge base prior to decision making. Consequently, there lies great potential in methods that facilitate the evaluation of strategies for infrastructural development across multiple knowledge areas, so-called multi-criteria decision aids (MCDAs). In the present article, observations from six case studies are discussed, where the common denominators are infrastructural planning, multi-stakeholder participation and the use of MCDAs as interactive decision support. Three MCDAs are discussed – NAIADE, SCA and STRAD – with an emphasis on how they function in their procedural context. Accordingly, this is not an analysis of MCDA algorithms, of software programming aspects or of MCDAs as context-independent 'decision machines' – the focus is on MCDAs as actor systems, not as expert systems. The analysis is carried out across four main themes: (a) symmetrical management of different forms of knowledge; (b) management of heterogeneity, pluralism and conflict; (c) functionality and ease of use; and (d) transparency and trust. It shows that STRAD, by far, seems to be the most useful MCDA in interactive settings. NAIADE and SCA are roughly equivalent but have their strengths and weaknesses in different areas. Moreover, it was found that some MCDA issues require further attention, i.e., regarding transparency and understandability; qualitative/quantitative knowledge input; switching between different modes of weighting; software flexibility; as well as graphic and user interfaces (Kain, Söderberg 2008).

Optimization is possible in the following transport networks areas: activities at sea ports, railways and customs; the possibilities of stevedoring and transportation complexes and activities of companies that provide transportation and other services as well as basics and tariff rates, etc. Information technologies may improve the efficiency of all transport modes and stimulate sustainable use of the services. For example, travel and traffic management services use guidance systems in order to inform road users about the trip's progress so that people can plan and choose the most rational route. Tracking systems help fleet operators to use resources of their fleets in a more efficient manner and to improve the transport's reliability, safety and services.

There are a number of companies wishing to carry out activities abroad and they are driven by many different reasons for doing so. Sometimes they wish to capitalize on the advantages that are typical of such companies or they try to enter larger and more profitable markets. Other companies seek to explore advantages that are unique to a specific country, etc. When such companies carry out activities in foreign countries both parties gain certain benefits. Organizations can use their resources in a more efficient way and the country can purchase products and services that meet higher quality standards and are less expensive than those offered by its own organizations. The required information on some particular country is gathered on the database. Various databases

located on the Internet should also be used. The effectiveness of a project's implementation largely depends on the level of the completeness of information. Therefore, the use of international decision support systems not only enables the decision-maker to obtain concrete information about some specific issues that are related to that particular country but also it facilitates the decision-making process. International decision support systems represent a hybrid approach: they combine decision support system technology with international activities of decision-making technology. International decision support systems are similar to traditional DSS in that they are made up of databases, a database management system, a model base, a model base management system and a user interface and mail management system.

The efficiency of construction work performed in a foreign country depends to a large extent on national laws, the specific economic or political situation and its technical and cultural level. The internationalization of activities of various organizations increases the competition between different participators and following such internationalization local resources are then used on a much larger scale. Specific local legal, economic, political, technical, technological and cultural environments have to be taken into account while performing construction work in other countries.

Wang (2005) describes a knowledge-based decision support system for measuring the performance of government real estate investment using DEA models. Wang (2005) proposes an evaluation framework for real estate investment, including a database, a model base, and a knowledge base, to create a tool that a government can use to deal with decision-making problems via the Internet. This decision support system converts numerical data into information that can be used to evaluate possible real estate investments. Particularly, rules in the rule base are explained in more detail for illustrating the process of reasoning and KDSSGREI adapts quickly and accurately to infer and generate suggestions or actions. Data envelopment analysis (DEA) is used to perform efficiency analysis in this paper. Finally, Wang (2005) applies China's case to obtain strategies for reforming real estate investment.

The Internet has become a significant transaction platform for the real estate industry. However, use of the Internet does not benefit homebuyers in terms of search time, flexibility, and intuitive results. While it does encourage buyers to search more intensively, and discover and visit more properties, it also wastes more time and energy (Yuan *et al.* 2013). To improve the efficiency of real estate searches, Yuan *et al.* (2013) developed an online homebuyer's search program, based on an investigation of search behaviors, and implement a user-oriented recommendation system for real estate websites via a combination of case-based reasoning and an ontological structure. An ontological structure is employed to improve information management efficiency while case-based reasoning

improves recommendation accuracy. A user test demonstrates the effectiveness of the proposed system and validates the findings of Yuan *et al.* (2013) study.

Managers of portfolios of sizeable income-producing properties face a series of significant short and long-range planning problems. Many of these can best be addressed by a DSS specifically designed for their needs (Trippi 1989). Trippi (1989) examines industry factors, design goals, and functions of a system used to improve major real property asset acquisition, improvement, and divestment decisions.

The aim of Diappi and Bolchi (2008) research is to investigate local housing market dynamics by applying an urban spatial model of gentrification based on Smith's rent gap theory [Smith, N. (1979). Toward a theory of gentrification: a back to the city movement by capital, not people. APA Journal, 538–548]. Smith's supply side approach explains the emergence of gentrifying neighbourhoods on the basis of investments spent in "large scale renewal projects" which only investors or developers looking for profits are able to carry out. They invest in degraded areas on the base of the gap between the actual rent and the potential rent after rehabilitation (rent gap). Afterwards the process is sustained by an imitative cooperative behaviour of property owners having advantage in investing in their properties since the quality of the nearby buildings, and their rents, arises. In Smith's thesis home owners, landlords and developers are the leading actors coming into play of gentrification; they behave according to the search of profit or to the enhancement of their property rents, but their decisions to invest or not are conditioned by the quality of the neighbourhood. Space is a founding element in Smith's approach to gentrification (Diappi and Bolchi 2008). Diappi and Bolchi (2008) investigated multi-agent systems and cellular automata as offering the most suitable modelling approach to the rent gap theory. A set of behavioural rules for each agent involved (homeowner, landlord, tenant and developer, and the passive agent "property unit") has been formalized in the model and implemented on a NetLogo platform. A wide range of urban system simulations have been carried on with different parameter values concerning size of the neighbourhood, rent gap threshold, and amount of capital invested. The state of each cell (property unit) at each cycle is defined in terms of rent value and a maintenance level. All the simulations show in the long run an oscillatory behaviour of the system. The study identifies the critical parameter values which affect radical changes in the system evolution (Diappi, Bolchi 2008).

Real estate confidence index, as an efficient and effective information-oriented measure, is being studied and applied to the China's real estate market. It not only assists government with the macro control of real estate market, but also guides investment and consumption. In order to assure the accuracy and real time of the RECI, more factors should be considered and an efficient

system based on IT is needed (Guo *et al.* 2007). Guo et al. (2007) present a set of real estate confidence indices via considering synthetically efficient demand and supply, latent demand and latent supply on the basis of domestic and overseas research status and establishes relevant mathematical models at all levels (Guo *et al.* 2007).

Ming and Hin (2006) investigate the challenge posed by an optimal balance of land use because of chronic land resource scarcity, in conjunction with the growing requirement for quality-intensive industrial accommodation in the island-state city of Singapore. Optimizing land resource, under a strong physical planning framework and its physical planning administration, is envisaged to set the conditions that facilitate the creation of values for urban industrial real estate assets. This value creation enables urban industrial real estate values to find their steady state levels, under a structure of causal links. It can significantly represent, although not completely, the efficient price mechanism for allocating land to its highest and best industrial use. Thus, a generalized multiple regression analysis model is estimated to robustly explain urban industrial real estate asset value in terms of the structural price-discovery factors, under the physical planning framework and its administration (Ming, Hin 2006). Ming and Hin (2006) extend the urban real estate valuation model to incorporate a geographic information system that enables a spatial distribution analysis of urban industrial real estate asset values.

Kummerow and Lun (2005) survey of changes in the real estate industry due to information and communication technology (ICT) covers three areas: (a) A brief survey of ICT applications in the property industry, (b) speculation about implications for market structure and productivity within the real estate industry, and (c) comments on the wider macroeconomic implications of these changes. Improvements in information and productivity may lead to important long-run changes in business processes and industry structure tending to favour larger firms and promoting specialization of functions. Changing the information structure of real estate decision systems could change system dynamics and improve allocative efficiency. On the other hand, under different institutional arrangements, better information could increase the amplitude of real estate cycles and destabilize economies (Kummerow, Lun 2005).

Zagonari and Rossi (2013) developed an innovative operational decision-support system (DSS) based on flood data and mitigation or recovery options, that can be used by both naïve and expert users to score portfolios of flood mitigation or recovery measures. The DSS combines exposure (i.e., economic, social, or environmental values at risk) and resilience (i.e., protection of the main equilibrium functions of human and physical systems). Experts from different fields define indices and functions, stakeholders express their attitudes towards risk, relative weights, and risk perceptions, and both groups use a shared

learning process for risk assessment. The DSS algorithms include the "technique for order performance by similarity to ideal solution" (TOPSIS) and the "basic linguistic term set" (BLTS) methods for heterogeneous multi-criteria multi-expert decision-making. Decisions are illustrated using fixed or bounded values of flood depth, duration, and frequency, with plausible parameter values, for a case study of Cesenatico. The best mitigation option was construction of sand dunes and development of evacuation plans, which achieved 32% of the potential net benefit. The best recovery option was construction of sand dunes and development of evacuation plans and insurance schemes, which achieved 42% of the potential net benefit. Mitigation options outperformed recovery options whenever the relative importance of exposure with respect to resilience was greater than 95%. Sensitivity analysis revealed that the best mitigation option was most robust with respect to flood duration and depth; the best recovery option was most robust with respect to the relative weights attached to economic, social, and environmental factors. Both options were similarly robust with respect to interdependencies between the options (Zagonari, Rossi 2013).

Web-based 3-D GIS may be the most appropriate tool for decision makers in land management and development. It provides not only the basic GIS functions, but also visually realistic landscape and architectural detail. It also gives the user an immersive 3-D virtual reality environment through the Internet that is rather different from that obtained merely through text, pictures, or videos. However, in terms of high accuracy and level-of-detail (LOD), the generation of a fully photo-realistic city model is labor intensive and time consuming. At the same time, from the aspect of computer graphics, the result is simply a geometric model without thematic information (Rau, Cheng 2013). Thus, the objective of this study is to propose a cost-effective multi-scale building modeling strategy based on the 2-D GIS building footprint that has rich attributes and to realize its application in the real estate market through a web-based 3-D GIS platform. Generally, the data volume needed for a photo-realistic city model is huge, thus for the purpose of increasing Internet data streaming efficiency and reducing the building modeling cost, a multiple-scale building modeling strategy, including block modeling, generic texture modeling, photo-realistic economic modeling, and photo-realistic detailed modeling is proposed. Since 2-D building boundary polygons are popularly used and well attributed, e.g., as to number of stories, address, type, material, etc.; Rau and Cheng (2013) are able to construct the photo-realistic city model based on this. Meanwhile, the conventional 2-D spatial analysis can be maintained and extended to 3-D GIS in the proposed scheme. For real estate applications, a location query system for selecting the optimum living environment is established. Some geospatial query and analysis functionalities are realized, such as address and road-junction positioning and terrain profile analysis. An experimental study area of 11 km^2 in size is used to

demonstrate that the proposed multi-scale building modeling strategy and its integration into a web-based 3-D GIS platform is both efficient and cost-effective (Rau, Cheng 2013).

The EU Soil Thematic Strategy calls for the application of sustainability concepts and methods as part of an integrated policy to prevent soil degradation and to increase the re-use of brownfields. Although certain general principles have been proposed for the evaluation of sustainable development, the practical application of sustainability assessment tools (SATs) is contingent on the actual requirements of tool users, e.g. planners or investors, to pick up such instruments in actual decision making (Bartke, Schwarze 2015). Bartke and Schwarze (2015) examine the normative sustainability principles that need to be taken into account in order to make sound land-use decisions between new development on greenfield sites and the regeneration of brownfields – and relate these principles to empirically observed user requirements and the properties of available SATs. In this way Bartke and Schwarze (2015) provide an overview of approaches to sustainability assessment. Three stylized approaches, represented in each case by a typical tool selected from the literature, are presented and contrasted with (1) the norm-oriented Bellagio sustainability principles and (2) the requirements of three different stakeholder groups: decision makers, scientists/experts and representatives of the general public. The research disentangles some of the inevitable trade-offs involved in seeking to implement sustainable land-use planning, i.e. between norm orientation and holism, broad participation and effective communication. It concludes with the controversial assessment that there are no perfect tools and that to be meaningful the user requirements of decision makers must take precedence over those of other interest groups in the design of SATs (Bartke and Schwarze 2015).

Newton *et al.* (2014) describe the development of a decision support tool for the positioning and sizing of vortex flow controls in existing sewer systems. The tool aims to prioritise the placement of vortex flow controls primarily within subcatchments with the greatest flood consequence rating and maximise the use of unused inpipe volumes during critical rainfall events. The decision support tool is intended for use in catchments where opportunities to implement SuDS and rainwater harvesting to defend against flooding are limited. The decision support tool is envisaged to identify potential strategies which could enhance flood resistance of sewer systems in a cost effective manner (Newton *et al.* 2014).

Luo *et al.* (2011) describe a group decision support system (GDSS) developed in response to the need of a computer supported collaborative work environment for implementing the value management (VM) methodology in construction briefing. The GDSS is based on the VM methodology that allows a client to define and represent his or her requirements with functions and functional performance, to bring forward ideas to achieve the functions, and finally to

evaluate and highlight the ideas against the functional performance for further development in design. The conceptual framework, design, implementation, use of the GDSS are addressed and described in that order. The system is complementally evaluated through a field study and an experimental study. It is concluded that the GDSS can effectively facilitate the implementation of VM in construction briefing. In addition, the GDSS has big potential to improve the performance of VM studies in terms of the enhanced participation and interaction, the shortened time for tasks, and the improved satisfaction with VM workshops (Luo *et al.* 2011).

The purpose of Pradhan (2013) study is to compare the prediction performances of three different approaches such as decision tree (DT), support vector machine (SVM) and adaptive neuro-fuzzy inference system (ANFIS) for landslide susceptibility mapping at Penang Hill area, Malaysia. The necessary input parameters for the landslide susceptibility assessments were obtained from various sources. At first, landslide locations were identified by aerial photographs and field surveys and a total of 113 landslide locations were constructed. The study area contains 340,608 pixels while total 8403 pixels include landslides. The landslide inventory was randomly partitioned into two subsets: (1) part 1 that contains 50% (4000 landslide grid cells) was used in the training phase of the models; (2) part 2 is a validation dataset 50% (4000 landslide grid cells) for validation of three models and to confirm its accuracy. The digitally processed images of input parameters were combined in GIS. Finally, landslide susceptibility maps were produced, and the performances were assessed and discussed. Total fifteen landslide susceptibility maps were produced using DT, SVM and ANFIS based models, and the resultant maps were validated using the landslide locations. Prediction performances of these maps were checked by receiver operating characteristics (ROC) by using both success rate curve and prediction rate curve. The validation results showed that, area under the ROC curve for the fifteen models produced using DT, SVM and ANFIS varied from 0.8204 to 0.9421 for success rate curve and 0.7580 to 0.8307 for prediction rate curves, respectively. Moreover, the prediction curves revealed that model 5 of DT has slightly higher prediction performance (83.07), whereas the success rate showed that model 5 of ANFIS has better prediction (94.21) capability among all models (Pradhan 2013). The results of Pradhan (2013) study showed that landslide susceptibility mapping in the Penang Hill area using the three approaches (e.g., DT, SVM and ANFIS) is viable.

Montes *et al.* (2015) present a linguistic multiple-expert multi-criteria decision making model and a web tool to support it, that is centred on the housing market. The web tool is integrated with the usual catalogue of resources for rental or for sale, enriched with the possibility of ranking a subset of properties according to the client‘s preferences and the internal knowledge associated

to the properties (Montes *et al.* 2015). Usually the description of a property is quantitative, thought in the case Montes *et al.* (2015) add qualitative information corresponding to assessments made by housing agents. These agents are considered experts in the market conditions. Montes *et al.* (2015) apply the 2-tuple linguistic representation model to keep accuracy in the processes of Computing with Words and the hesitant fuzzy linguistic term sets to qualify in situations of uncertainty and hesitation in the assessments. The software helps the agents in the process of the elicitation of the linguistic expression based on the fuzzy linguistic approach and the use of context-free grammars, and the web clients in the decision of visiting a property (Montes *et al.* 2015).

Spatial Analysis and Decision Assistance (SADA) is a Windows freeware program that incorporates spatial assessment tools for effective environmental remediation. The software integrates modules for GIS, visualization, geospatial analysis, statistical analysis, human health and ecological risk assessment, cost/benefit analysis, sampling design, and decision support. SADA began as a simple tool for integrating risk assessment with spatial modeling tools. It has since evolved into a freeware product primarily targeted for spatial site investigation and soil remediation design, though its applications have extended into many diverse environmental disciplines that emphasize the spatial distribution of data. Because of the variety of algorithms incorporated, the user interface is engineered in a consistent and scalable manner to expose additional functionality without a burdensome increase in complexity. The scalable environment permits it to be used for both application and research goals, especially investigating spatial aspects important for estimating environmental exposures and designing efficient remedial designs. The result is a mature infrastructure with considerable environmental decision support capabilities (Stewart, Purucker 2011). Stewart and Purucker (2011) provide an overview of SADA's central functions and discuss how the problem of integrating diverse models in a tractable manner was addressed.

In response to the catastrophic outcome of the 2008–2009 Financial Crisis (Eastburn, Boland 2015) report on a qualitative study of decision maker surprise in the banking industry. Banks use a remarkably sophisticated ensemble of information technologies for supporting their management control systems and enabling oversight by government regulators and industry watchdogs. Banks depend on a global network of data processing and information systems to provide their core banking services and to manage the complex financial and macroeconomic elements of their environment. They are also subject to federal and/or state oversight, which includes on-site examinations and quarterly financial data monitoring, to reaffirm their safety and soundness. Yet, the financial crisis caught them unawares (Eastburn, Boland 2015). To get behind the headlines of the crisis, Eastburn and Boland (2015) opted to not study crisis decisions

overtly, but rather to explore bankers' general ability to interpret the data that they were receiving via their information technologies and observations and to follow a number of crisis and non-crisis decisions that had surprise outcomes for them. Eastburn and Boland (2015) focus is on understanding the context, process and patterns of decisions that resulted in surprise outcomes for bankers. Eastburn and Boland (2015) interviewed 23 senior executives from banks in the southeast who recounted fifty-one post-decision surprises that had occurred between 2008 and 2010. From analyzing those interviews, Eastburn and Boland (2015) found that they attributed surprise outcomes of their decisions to specific behaviors, including their complacency and over-confidence, their over-trusting of others, their deviation from protocol, their habitual information reporting and decisioning efforts, and their deficient detection of warning signals. In addition they tended to rationalize surprise outcomes by diverting blame to others. Combined, these symptoms reveal a chronic organizational and cultural susceptibility for being surprised. It was evident from Eastburn and Boland (2015) analysis that the bankers exhibited a narrow focus of attention and a reduced sense of inquiry, refrained from calibrating their mindfulness with the complexity of their decisions, limited their sense of accountability and experienced rigidity in procedures from bank routines and information standardization. Together, these elements nurtured less-mindful behavior and triggered surprise outcomes. Given the important role banks play in our financial world and the ineffectiveness of their elaborate information support systems for reliable management control the results are disturbing (Eastburn, Boland 2015).

The demand for family financial planning (FFP) services is growing dramatically as the financial market grows more complex and people become more aware of the importance of qualified financial guidance (Gao *et al.* 2007). To provide decision support for FFP-related decisions, Gao *et al.* (2007) formulate a conceptual model for FFP by following Simon's decision-making process model and map Gao *et al.* (2007) model to the generic FFP process.

Geographic information systems (GIS) technology provides an opportunity to improve real estate analysis by linking geography (location) with specific types of data (demographic, consumer profiles, competition, transport networks and travel routes, distance, etc.). There are a number of different property types and people interested in real estate that might benefit from GIS technology. These types of properties include land, industrial, residential, office, retail and shopping centers, and entertainment and recreational properties. Public and not-for-profit land uses such as hospitals, public buildings, and churches also may benefit from GIS analyses. People interested in buying or selling real estate, as well as investors, may also want to use GIS applications. A variety of types of real estate analyses are possible including but not limited to the following: site location, appraisal applications, selling real estate, financial institution lending

practices, compliance with environmental regulations, and national–international applications (Fletcher 2003).

Economic and population growth, higher life quality standards, and lower interest rates have led to an increase in the demand for housing. However, in many urban areas, land for housing is becoming scarce, and environmental and construction requirements more stringent. Therefore, the need arises for an adequate methodology to evaluate the urban built space under different perspectives (consumers, promoters, municipal authorities, etc.) and multiple evaluation criteria. A decision support system for housing evaluation integrates a problem editor, a data base management module, a set of multiple criteria decision aid methods and an adequate Human–computer interface, which can be integrated with GIS tools (Natividade-Jesus *et al.* 2007).

The vastly increasing number of online hotel room bookings is not only intensifying the competition in the travel industry as a whole, but also prompts travel intermediates (i.e. e-companies that aggregate information about different travel products from different travel suppliers) into a fierce competition for the best prices of travel products, i.e. hotel rooms. An important factor that affects revenues is the ability to conclude profitable deals with different travel suppliers. However, the profitability of a contract not only depends on the communication skills of a contract manager. It significantly depends on the objective information obtained about a specific travel supplier and his/her products. While the contract manager usually has a broad knowledge of the travel business in general, collecting and processing specific information about travel suppliers is usually a time and cost expensive task (Kisilevich 2013). Kisilevich *et al.* (2013) goal is to develop a tool that assists the travel intermediate to acquire the missing strategic information about individual hotels in order to leverage profitable deals. Kisilevich *et al.* (2013) present a GIS-based decision support system that can both, estimate objective hotel room rates using essential hotel and locational characteristics and predict temporal room rate prices. Information about objective hotel room rates allows for an objective comparison and provides the basis for a realistic computation of the contract's profitability. The temporal prediction of room rates can be used for monitoring past hotel room rates and for adjusting the price of the future contract. Kisilevich *et al.* (2013) makes three major contributions. First, Kisilevich (2013) present a GIS-based decision support system, the first of its kind, for hotel brokers. Second, the DSS can be applied to virtually any part of the world, which makes it a very attractive business tool in real-life situations. Third, it integrates a widely used data mining framework that provides access to dozens of ready to run algorithms to be used by a domain expert and it offers the possibility of adding new algorithms once they are developed. The system has been designed and evaluated in close cooperation with a company that develops travel technology solutions, in particular inventory management

and pricing solutions for many well-known websites and travel agencies around the world. This company has also provided us with real, large datasets to evaluate the system. Kisilevich (2013) demonstrate the functionality of the DSS using the hotel data in the area of Barcelona, Spain. The results indicate the potential usefulness of the proposed system.

Europe is facing one of its most challenging crises since Great Depression and the construction sector is one of the worst affected. Refurbishment is therefore often suggested as one of the most useful solutions for the current real estate crisis in consolidated areas like the EU. On the other hand, it is imperative to construct buildings according to sustainable principles regarding economic, environmental and social issues. Therefore, proper decision-support methods are needed to help designers, investors and policy makers to choose the most sustainable solution for a refurbishment project, especially for energy retrofit works. This paper reviews the works relating to sustainable refurbishment decision-support tools which have already been developed (Ferreira *et al.* 2013). For this purpose Ferreira *et al.* (2013) have analysed and classified 40 different methods, with particular focus on their main common aims. They are also compared with other classifications proposed. Ferreira *et al.* (2013) further highlights the role of energy as a driving factor and discusses what other research developments are needed to create related tools for the future that could respond to actual construction requirements.

Research on the barriers for building renovation in Denmark has revealed that an important obstacle is a lack of simple and holistic tools that can assist stakeholders in prioritisation and decision-making during the early stages of building renovation projects. The purpose of this article is to present a tool – RENO-EVALUE, which can be used as decision support for sustainable renovation projects, and for evaluation, during and after building renovations. The tool is a result from the European Eracobuild project ACES – "A concept for promotion of sustainable retrofitting and renovation in early stages" (Jensen, Maslesa 2015). Jensen and Maslesa (2015) present the main result of a work package concerning benefits of renovation. RENO-EVALUE has been developed from four case studies on renovation projects in Denmark, tested and validated on the cases and in a Delphi study. The tool is value based by focusing on the different interests and values of the main stakeholders involved in building renovation. It is meant as a basis for dialogue among building professionals and building users and supports formulation of objectives for renovation projects. RENO-EVALUE can also be used for comparing alternative project proposals and to follow-up on a project and assess the results. The tool covers the four main parameters: Stakeholders, Environment, Organisation, and Economy. The evaluations are collected from different stakeholders by use of standardised information and interview templates. The test results of one case study of a social housing estate are presented (Jensen, Maslesa 2015).

The importance of the refurbishment market in the construction industry has grown considerably in recent decades, especially in developed countries, where it sometimes represents nearly 50% of the market. At the same time, sustainability has become an imperative target for development, and therefore sustainable principles will have to be an integral part of refurbishment projects in the near future. However, financial resources are very limited and the ability of decision-support tools to embrace all these aspects needs urgent assessment (Ferreira *et al.* 2013). The aim of this research is to review what has been done in terms of refurbishment decision support tools, from a user's perspective. Thus, it first reviews the objectives and criteria of each tool to help users (architects, engineers and owners) to select the most suitable method for each particular situation. Their approaches and applicability are also discussed and classified on a simple scale to help users to choose the best algorithm from those tools whose objectives and criteria might meet their expectations. A complementary review is reported on what has been started in Portugal (Ferreira *et al.* 2013). Finally, Ferreira *et al.* (2013) consider the likely options in terms of the main needs and areas of future research.

Shen *et al.* (2003) presents a computer-aided decision support system for assessing a contractor's competitiveness. Measures of competitiveness are employed to describe a contractor's strengths and weaknesses, thus to assist project clients in identifying proper contractors at the pre-qualification stage. The identification of a contractor's weakness can also help the contractor adopt proper measures to improve its competitiveness. Based on a competitiveness scoring model, a Windows-standard Decision Support System Contractor's Competitiveness Assessment Scoring System (C-CASS) was developed in this research. Case studies in a simulated environment are used to demonstrate the application of this system (Shen *et al.* 2003).

Group Decision Support System (GDSS) is a branch of information technology, which combines communication, computing and decision support technologies to facilitate the formulation and solution of unstructured problems by a group of people. A foundation for the study of group decision support systems. It has the potential to promote active participation, encourage interactions, and facilitate decision analysis in Value Management (VM) studies (Shen, Chung 2002). Because of this potential and the strong demand for improving VM studies in Hong Kong and the rest of the world, Shen and Chung (2002) presents findings of a research project which demonstrates how GDSS can improve VM studies and the potential benefits of using a GDSS in VM studies. It begins with an introduction to the GDSS technology and its development, followed by a detailed description of the structure and functionalities of an Interactive Value Management Systems (IVMS) a special GDSS designed for supporting and improving VM studies. The potential benefits of using the system in VM studies are also discussed by Shen and Chung (2002).

Rapid growth in regions surrounding large metropolitan areas leads to the phenomenon of urban sprawl. In states like Michigan, land is being converted at a rate seven times greater than formerly used (and potentially contaminated) sites are being redeveloped. City governments now see these unused or abandoned areas as important assets in realizing the goal of urban revitalization. New legislation in Michigan provides economic (e.g. tax recapture) and legal (e.g. suspension of retroactive liability) incentives for local governments and prospective developers who are now seeking these brownfields instead of farmland and open space. To evaluate land use options with respect to brownfields inventory, characterization, and potential for redevelopment, both government and private decision-makers need access to information regarding land capability; development incentives; public goals, interests, and preferences; and environmental concerns such as site contamination and environmental quality (Thomas 2002). Thomas (2002) discusses a decision support system that provides access to state, regional, and local geospatial databases, several informational and visualization tools, and assumptions useful in providing a better understanding of issues, options, and alternatives in redeveloping brownfields. The resultant decision support system is augmented by a unique geographic information systems (GIS)-based land use modeling application called Smart Places® as an integrated expert system. The decision support system is being tested in a city- and county-level brownfield identification, screening, and marketing effort in Jackson County, Michigan. This project represents a testbed for decision-makers and policy analysts at all levels of government to establish urban land use policy and development guidelines that may be applicable to related land use issues in a variety of urban and urbanizing settings. While this project was conducted in Michigan, the tools and procedures used are seen as readily adaptable to other locations (Thomas 2002).

An ideal multi-objective financial decision support (MFDS) model for contractors should have ability of handling both the quantitative and qualitative inputs (Lam *et al*. 2009). Lam *et al*. (2009) aims to develop a new MFDS model, which attempts to provide a more accurate way to support financial decision-makers in Chinese state-owned construction firms. Owing to the slow progress of passing the construction regulations, coupled with the inherited ownership problems in the Chinese booming construction industry, it is logical for Chinese project managers to make financial decisions with the consideration of the four objective functions (profit margin, risk factors, government relationship and market share), which are realistic representations of the present situation of Chinese construction industry. The proposed MFDS model is a practical method to support financial decision-making. For the model's computational performance, Module 3 (stochastic universal sampling selection, adaptive crossover and adaptive mutation of Genetic Algorithm) is more superior (Lam *et al*. 2009).

Considerable efforts are made to integrate ecosystem services (ES) indicators into spatial planning practice. Although a lot of decision support systems already provide helpful functionalities, they are not yet integrated into everyday decision-making, mainly because they do not readily fit into planning processes in practice. There is an increasing awareness that the development should foster collaboration between interdisciplinary researchers and the end users of the tools to secure their suitability for such planning processes. Hence, user-oriented research and experimenting is seen as the appropriate approach for getting the tools ready for practice. Guidelines for conducting such processes are yet missing (Hayek *et al.* 2015). Here, Hayek *et al.* (2015) contribute to the development of such guidelines by means of a practical case study. The focus is placed on how transdisciplinary (TD) research on spatial decision support systems should be designed for the integration of ES indicators into planning practice. In a TD project, a web-based visualization platform with indicators of relevant ES was developed to support municipalities of the Canton of Zurich, Switzerland, in assigning adequate watercourse corridors according to the revised Swiss Waters Protection Act. A preliminary as well as an enhanced version of the platform prototype were demonstrated to different actors for evaluating the platform‘s readiness for practice. Hayek *et al.* (2015) assessed the process design and the quality of the product in a discursive manner. Thereby, Hayek *et al.* (2015) implemented a set of assessment criteria derived from literature and adapted them to the case study at hand for the analysis of empirical material (participant lists, project schedule, meeting minutes and observation protocols). Finally, Hayek *et al.* (2015) discussed the lessons learned on developing significant ES indicators and their visualization and the conclusions drawn with respect to ensuring the quality of the platform development process. The results show that conceptualizing the ES indicators in strong collaboration with practice representatives increased their relevance to the actors' needs and therefore their legitimacy. Providing interfaces for collaboratively translating practical approaches into scientific models is, thus, crucial for the development of significant indicators. Furthermore, specifying the purpose of the visualization platform in planning processes requires prototyping and iterative conceptualization, because practice actors need concrete examples to express their specific demands (Hayek *et al.* 2015).

Several business sectors have identified the potential benefits of a landscape/urban assessment based upon the objective appraisal of the interaction of the cultural and natural landscapes (Cudlip *et al.* 1999). Cudlip *et al.* (1999) describe a recently approved project (PLAINS) funded by DGXII of the European Union under the Framework IV Environment and Climate Programme. The aim of this project is to identify the benefits of introducing satellite Earth Observation data into the landscape assessment process and to develop a decision support system that will provide for landscape/urban classification tuned to satisfy specific

customer requirements. The system will also allow the exploration of impact assessment ('what if') scenarios. The project involves three different business sectors who have inherently similar requirements in landscape assessment. The 'customer' organisations involved in the project cover the sectors: regional planning authorities, Estate Agents and tourism. In all, there are 13 partners involved in the project from five countries (UK, Denmark, Germany, Italy, Poland). The initial development of the system will use test sites in the counties of Hereford and Worcester in the UK, with subsequent validation being carried out at sites in Italy (Province of Savona), Germany and Poland (Cudlip *et al.* 1999).

Land is increasingly becoming important as the global economic crisis and climate change impacts continue to grow. This is mirrored in Zambia where the management of land has become very critical, prompting urgent government intervention/regulatory measures in the form of land reform. However, lack of efficient communication mechanisms inhibits the success of these efforts as officials are unable to make efficient land delivery decisions (Abanda *et al.* 2011). Abanda *et al.* (2011) investigate the extent to which Semantic Web technology, an emerging communication technology, can be used in developing decision support systems that can facilitate the Zambian land delivery process.

Sustainable urban development requires the integration of environmental interests in urban planning. Although various methods of environmental assessment have been developed, plan outcomes are often disappointing due to the complex nature of decision-making in urban planning, which takes place in multiple arenas within multiple policy networks involving diverse stakeholders (Stigt *et al.* 2013). Stigt *et al.* (2013) argue that the concept of 'decision windows' can structure this seemingly chaotic chain of interrelated decisions. First, explicitly considering the dynamics of the decision-making process, Stigt *et al.* (2013) further conceptualized decision windows as moments in an intricate web of substantively connected deliberative processes where issues are reframed within a decision-making arena, and interests may be linked within and across arenas. Adopting this perspective in two case studies, Stigt *et al.* (2013) then explored how decision windows arise, which factors determine their effectiveness and how their occurrence can be influenced so as to arrive at more sustainable solutions. Stigt *et al.* (2013) conclude that the integration of environmental interests in urban planning is highly dependent on the ability of the professionals involved to recognize and manipulate decision windows.

Decision support often focuses on substantive rationality (what to choose). The procedural rationality (how to choose) of the process of long-term strategic decision making is then often neglected. In strategic decision making, supporting the decision process is more important than supporting the search for an "optimal" solution to the problem, especially since for most policy problems a well-defined objective function does not exist. Such a problem occurs in setting

the energy policy for the Indonesian island of Java. Indonesia wants to introduce natural gas into the fuel mix. Ways to support this decision making process with the existing level of IT were analyzed. Because the government of a developing country has very small funds to invest, a specialized group decision support system (GDSS) was designed to allow for long-term support (Groenendaal 2003).

Barton *et al.* (2005) report the development of a Spatial Decision Support System (SDSS) that is currently in the early stages of implementation and testing. The project is a joint undertaking between the University of New South Wales (UNSW) and the NSW Department of Housing (DoH). It features a robust, non-proprietary data structure incorporating 3D spatial models, use of VRML/X3D for graphics modelling and incorporating XML based data and customised tools to support effective web-based user interaction. Although the broader project aims to develop an SDSS that supports all aspects of the management of public housing for a governmental authority, Barton *et al.* (2005) focuses specifically on a module to support public participation through the capture of community feedback and other input. Barton et al. (2005) an outline of the immediate context of this work, both in terms of the local community being used as the test bed for this implementation as well as comparing this work to similar undertakings in other places. It goes on to describe the unique approach taken in this project toward the structuring of the geo-spatial data that lies at the heart of the system and the tools developed to support user interaction and community participation. Barton *et al.* (2005) concludes with a discussion of on-going issues encountered during the development and implementation of this system, and proposals for future developments.

Understanding the relationship between environmental factors and public health is critical to improving sustainability at a sub-national level. Proposals to evaluate the status of environmental health in a region must consider factors including the diversity of indicators, geographical scale, incomplete or inaccurate data and the need for focused methodologies that capture the complexity of this subject (Canavese *et al.* 2014). Canavese *et al.* (2014) present the design of a system based on expert knowledge to assess environmental sanitation in cities in the Algarve region of Portugal. It was used fuzzy logic to assess uncertainties in the system. Conceptually, the use of fuzzy sets theory is simple and can integrate human expertise. The current proposal demonstrates the usefulness of aggregating information and opinion-based classifications to categorize municipalities according to their environmental health characteristics. The analysis shows that improved environmental sanitation conditions have been observed in municipalities located in the region's center. In the west, municipalities have worse conditions not only in environmental health but also in other sustainability indicators. A main feature of the system, presented here, is the ability for users to select variables to be considered by experts and opinion-makers

without re-modeling, which allows the system to be adapted to different situations and scenarios. Therefore, the assessment method based on fuzzy logic is useful to investigators looking for a more systemic assessment of sustainability (Canavese *et al.* 2014).

Spatial decision support systems (SDSS) are a branch of data-driven decision support systems that utilize spatial data in the decision-making process (Li *et al.* 2004). Li *et al.* (2004) introduces a simple and inexpensive way of designing SDSS to support property professionals in their decisions concerning locations, throughout the property development process. The proposed SDSS integrate traditional decision support systems with geographical information systems (GIS) to have the best of both worlds: GIS capabilities and modeling ability. The design of the SDSS utilizes two widely used software packages: Excel and MapObjects. Excel is a spreadsheet program that has the strong capability to construct models using its built-in functions and Visual Basic for Application (VBA). MapObjects is a collection of embeddable mapping and GIS components from ESRI. Using these ActiveX automation objects, application developers can add mapping and GIS capabilities to applications. When MapObjects controls are integrated with an Excel sheet, they have the ability to save and show maps, query addresses, and carry out other interactive functions. The development environment and the working mechanism for the proposed systems are introduced, which is further elaborated by providing a case study on how the proposed SDSS can be used by property professionals (Li *et al.* 2004).

Danenas *et al.* (2011) present a study on development of credit risk evaluation model using Support Vector Machines based classifiers, such as linear SVM, stochastic gradient descent based SVM, LibSVM, Core Vector Machines (CVM), Ball Vector Machines (BVM) and other. Discriminant analysis was applied for evaluation of financial instances and dynamic formation of bankruptcy classes. The possibilities of feature selection application were also researched by applying correlation-based feature subset evaluator and Tabu search (Danenas I. 2011). Danenas *et al.* (2011) showed that different SVM classifiers produced similar results, including Core Vector Machines based classifier. Yet proper selection of classifier and its parameters remains an important problem.

Majeske and Lauer (2013) develop a probability model to evaluate the predictive validity of two-way classification schemes in the context of personal credit scoring and bank loan applications. The Bayesian decision model provides a structure for identifying classification rules that lead to optimal-maximum expected payoff or minimum expected cost-classifications. Using payoffs from multiple perspectives allows identifying conditions where the various perspectives produce contradictory classifications generating either profit premiums or cost penalties depending on the perspective (Majeske, Lauer 2013).

Geneletti *et al.* (2007) presents and discuss the construction of a spatial decision-support tool for the Strategic Environmental Assessment (SEA) of a land use plan: the spatial coordination plan of the Province of Naples, in southern Italy. The decision-support tool organises the relevant information, spatially resolves the actions of the plan, predicts their environmental impacts, and generates overall performance maps. Its final goal is to provide a suitable technical support to a formal SEA procedure. The expected implications of the plan, such as changes in land use and traffic flows and urban expansion, were modelled and assessed against a set of environmental criteria using SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis and mapping. It was found that the SWOT analysis provided a good basis for assessment and strategy formulation (Geneletti *et al.* 2007). Geneletti *et al.* (2007) also intends to contribute to the topic of data and scale issues in SEA, by exemplifying the role played by spatial data and spatial analyses to support informative SEA.

Making appropriate decisions concerning the ongoing management of existing built facilities is an important activity for property and facilities managers (Langston, Smith 2012). Langston and Smith (2012) describe the development of a new conceptual framework for making better decisions about built assets at an early stage in the process, with a view to identifying which course of action to pursue. The resulting model, known as iconCUR, uses a weighted matrix methodology to obtain performance scores for condition, utilization and reward that are capable of mapping property decisions in 3D space over time. Via a case study of a real project in Sydney (Australia), the application of iconCUR is shown to be both practical and an example of decision-making using an adaptive management (or 'learning by doing') philosophy. The benefit of adopting iconCUR to assist with property management decisions lies in its ability to quickly assess, identify and rank available opportunities according to potential value added. The spatial coordinates that underpin the 3D model enable certainty levels to be reported objectively through measuring the distance between current property performance and optimum decision corners that define the cubic boundaries of the model (Langston, Smith 2012).

Ten LCC-oriented environmental accounting tools suggested as useful in environmental decision-making have been identified. However, their implementation in the building industry seems to be limited, which opens up for a conceptual discussion (Gluch, Baumann 2004). The purpose of Gluch and Baumann (2004) research is to discuss theoretical assumptions and the practical usefulness of the LCC approach in making environmentally responsible investment decisions. LCC's monetary unit and extended scope may speak in favour of using LCC but LCC fails to handle irreversible decisions, neglects items that have no owner and does not consider costs to future generations. Moreover, LCC does not take into

account the decision makers' limited ability to make rational decisions under uncertainty. LCC's practical usefulness is constrained by its oversimplification to a monetary unit, the lack of reliable data, complexity of the building process and conceptual confusions. To handle these inconsistencies in future development of environmental decision support tools three research solutions are proposed (Gluch, Baumann 2004).

Planning control decisions are often characterized as results of a complex deliberation process that involves consideration of many factors (Tang, Choy 2000). Tang and Choy (2000) exploratory study uses logistic regression to investigate whether it is possible, based upon a small number of quantifiable variables, to correctly predict the past decisions on 162 planning applications for commercial-office development in urban Kowloon of Hong Kong. Tang and Choy (2000) final quantitative model identifies four key factors that can explain up to 77% of the decisions, but none of these factors are included in the formal planning guidelines. Tang and Choy (2000) suggest the need for further research into the local planning control decision making process, particularly in relation to the issues of certainty and flexibility, the relationship between planning and market, and interaction between policy and decision.

The rapid development of microprocessor-based technologies and the increasingly sophisticated demands for high performance working environments have prompted an increasing number of developers to consider adding 'intelligence' to their new buildings in order to improve the buildings' operational effectiveness and efficiency to enhance marketability. However, the lack of satisfactory consensus for characterizing the system intelligence and structured analytical decision models, inhibit the developers and practitioners to understand and configure optimum intelligent building systems in a fully informed manner. Little research has been conducted towards aiding in decisions and appraisal of the building systems and components in the intelligent building (Wong *et al.* 2008). Wong *et al.* (2008) aim to identify the key intelligent indicators, and map the analytical decision models for the system intelligence appraisal of the intelligent building systems. A total of 69 key intelligent indicators were identified for eight major intelligent building systems. The analytic network process (ANP), a systemic analytical approach, is proposed to prioritize the intelligent indicators and develop the model for computing the system intelligent score (SIS) – a measurement of the system intelligence of the intelligent building systems. ANP further enables the decision-makers to take the interdependent relationships between the intelligent attributes and the building's operational goals/benefits into consideration. Their applicability will be also validated and demonstrated using a real intelligent building project as a case study. The main contribution of this research is to promote and enhance understanding of the key intelligent indicators, and to set the foundation for a systemic framework that can be used

for appraising system intelligence of various intelligent building systems. It aims to provide developers and building stakeholders a consolidated inclusive tool for the system intelligence evaluation of the proposed components design configurations (Wong *et al.* 2008).

Group Support System (GSS) is a set of techniques, software and technology designed to focus and enhance the communication, deliberations and decision-making of groups. The thousands of GSS experimental studies and field studies that have been conducted in the past 2 decades demonstrate that GSS is successful in improving the efficiency, reliability and quality of the group decision-making process in meetings (Shen *et al.* 2004). Shen *et al.* (2004) aim to introduce the application of GSS to support Value Management (VM) studies so as to improve the implementation of VM in the construction industry. It begins with an introduction to VM and the problems of implementing VM in construction, e.g. lack of information, lack of participation and interaction and difficulties in conducting evaluation and analysis. This is followed by a description of a GSS framework for VM studies and a specific GSS prototype system to illustrate how this framework can provide support in discussion, information, collaboration and decision analysis to overcome the existing problems in VM studies (Shen *et al.* 2004).

Site monitoring is an indispensable procedure in construction quality control. It does not only minimize construction defects and human errors but also supports project team members making strategic decisions at critical points throughout the construction stages (Leung *et al.* 2008). Leung *et al.* (2008) present a cost-effective construction site monitoring system integrating a long-range wireless network, network cameras, and a web-based collaborative platform. The system supports simultaneous user access therefore project team members could view real-time captured images or video of a construction site, discuss and exchange ideas with gadgets such as video conference, text and shared whiteboard at a distance via the Internet. It was carefully configured in order to maintain the reliability under the reactive conditions of the construction sites. The system has been implemented and tested on two construction sites and promising results were obtained (Leung *et al.* 2008).

Due to an increasing demand for energy and rising energy prices, efficiency in energy consumption is fast-becoming a topic of significance. The building and construction sector has seen an increase of approximately 30–40% of overall energy consumption occurred; this has exceeded other major sectors such as industry and transport. Given the number of buildings and the cost of energy required to support these buildings, the developing of new approaches in the construction sector will be likely. This situation forces the various stakeholders to implement energy rating procedures to assess buildings' energy performance. The most commonly utilized building environment assessment method currently

used in Europe is the Building Research Establishment Environmental Assessment Method (BREEAM). Parallel to Europe, Turkey started its National Building Energy Performance Calculation Methodology (BEP-TR) in 2010. BREEAM and BEP-TR like other methods, require a lot of detailed and particular information in order to be implemented, and the procedure is fairly complicated. In addition, decision support systems can involve assessments, developed as a result of imprecise data in a qualitative manner. "Fuzzy set theory" can play a significant role in this kind of decision-making situation. This paper examines a "fuzzy multi-criteria decision making (MCDM)" approach in order to analyze BEP-TR. This approach was applied to categorize alternative buildings according to their overall energy performance. Results are discussed in terms of developing a new and practical building rating system (Kabak *et al.* 2014).

Risk communication has recently evolved from the design of unidirectional (from scientists to the public) information flow toward a more integrative deliberative procedures (involving scientists, policymakers, stakeholders and the general public) aimed at reconciling diverging social constructs of risk. Furthermore, risk communication is seen now as an activity that is transverse to the risk governance process as a whole. Risk communication is therefore part of the preassessment, appraisal, characterization/evaluation and management phases of risk governance. At the same time the development of risk management Decision Support Systems are increasingly geared at facilitating decision making while taking into account and streamlining all the phases of the risk governance process. These recent trends lead to a redefinition of the role of risk communication in the context of the development of DSS (Kane *et al.* 2014). Kane *et al.* (2014) explore these issues by analysing how risk communication can be integrated into THESEUS's DSS. A first step of this analysis consists of applying grounded theory to analyse stakeholders' perception in three of THESEUS's application settings. Kane *et al.* (2014) then compare this theorization to the grounded theorization of the foundational model of THESEUS's DSS. The result of this comparison points to diverging, yet not incompatible, paradigmatic views on the nature of coastal risks. These divergences are further analysed through semi-structured interviews with key informants involved in the development of the DSS. Building on these results Kane *et al.* (2014) develop a communication scheme that should allow a progressive convergence of paradigmatic views occurring through the use of the DSS; Kane *et al.* (2014) are thus proposing that the DSS in itself be a locus where risk communication as a deliberative practice occurs. In order to achieve this Kane *et al.* (2014) propose that the cognitive pathways followed by DSS users be proactively designed and involves integrative exchanges between designers, users and policy makers.

6.3. e-Business and decision support

There are three e-business models prevailing currently in the world: business to business, business to customer, customer to customer. There are also other electronic business models used, such as: public institution – to business, public institution – to customer, public institution – to public institution. Below is a brief description of the aforementioned models.

The business-to-business model covers electronic intercommunication (i.e. contacts with suppliers, purchase orders and exchange of documents, etc.) and electronic transactions between companies. This wholesale model of electronic business allows the union of currently existing information systems used by companies with those of electronic business which provides companies with the possibility to enhance the efficiency of their internal operations, improve their intercommunication and increase performance rates. Most of e-business today is of this type.

The business-to-customer model describes electronic retail trading

The customer-to-customer model defines electronic interrelations among customers. Examples are selling residential property, real estate electronic auctions, advertising personal services on the Internet and selling knowledge and expertise.

The public institution-to-business model covers electronic communication and electronic transactions between business and public institutions e.g. promulgation of governmental laws, maintenance, mailing and registration of business records, VAT refunds and the execution of other transactions between public institutions and business organizations.

The public institution-to-customer model defines electronic cooperation and electronic transactions between customers and public institutions as 'the spreading of information and the implementation of taxation, health, education and other programs'. By communicating with public institutions within this model people register their cars, pay taxes, file applications for construction permits, whereas the government and its institutions process such applications, proposals and other documents place on the Internet.

The public institution-to-public institution model describes electronic cooperation among public institutions. This term also is widely used as "electronic Government".

Electronic business has analogous stages to those existing within traditional businesses. The major difference is that the process of business takes place in cyberspace, i.e. marketing, financial analysis, purchase orders, maintenance of documents, payments and transportation, etc. that can be made electronically. For example, the sale of electronic products (e.g. software, music, video records and games, etc.) reflects a qualitatively new way of trading where the whole cycle of commercial transaction can be performed through the Internet.

Further on a brief description of the main provisions by electronic business is following:

- Detailed information about products and services should be placed on the Internet. Orders are placed and processed on the Web.
- High quality of servicing customers from the completion of ordering forms to delivery of products on a door-to-door basis as well as the maintenance of constant contacts with customers. The customer is provided with the possibility to receive detailed information on the process of a purchase and the delivery of products/services through the Internet, e-mail and telephone. The aim of keeping constant contact with the customer (e.g. supplying the customer with relevant information) is to avoid an interruption of relations.
- The buyer has the possibility to pay for all products and services without going away from the computer and settle all things in real time. Payment transactions are carried out safely and swiftly. When customers place an order or pay for it, they immediately receive an electronic acknowledgement by e-mail or in the form of a mobile phone message.
- The ordered items are delivered as quickly as possible. This is one of the main factors determining the efficiency of electronic business. The shipment of electronic products (e.g. software, music, video records, games, electronic newspapers, magazines and books, etc.) reflects the qualitatively new systems of transportation. Transport also has the added advantage of using 'tracking' of shipments.
- Legal basis regulating electronic business helps to settle any disputed situation transparently and in a way that is acceptable to each interested group.

E-business is also based on other important disciplines such as marketing, computer science, consumer behaviour and psychology, finance, economics, management information systems, accounting and auditing, management, business law and ethics, etc.

With the aim of correctly understanding the role of the e-business and its development prospects, it is necessary to investigate the main micro, meso and macro-level factors influencing its existence. Various economic, legal, social, technological and political factors force the traditional business one way or another to transform into e-business. Connected to different changes such as the increased qualifications of the workforce, minimization of state regulation, reduction of state subsidies, the increased importance of ethic and legal issues, tough competition, global economy, regional trade agreements, cheaper manpower in certain countries, frequent and significant changes within the markets, the increased power of consumers, accelerated moral depreciation of technologies, the increased importance of innovations and modern technologies, it has become necessary to create e-business.

Today universally the Internet, information technologies and electronic businesses are rapidly expanding throughout all spheres of activities. Large amounts of information is stored and databases are created on the basis of which thousands of high quality experts pass on their experiences and expertise through the Internet for a comparatively low price. Thousands of various unique services are offered online.

Competition within different fields of the e-business is becoming stronger and stronger, and involves more and more business people. In order to survive in such tough competition conditions, it is necessary to make every effort and aim at creating and offering something better than your competitors. For example, enhancement of the quality of services and reduction of prices, expansion of markets, flexibility in responding to fluctuations of the demand and supply in the market, extension of the range of commodities and services, strengthening of relations with the manufactures and suppliers of necessary commodities and services, faster communication with the Internet, increase in the number of regular customers, combination of electronic business systems with a company's current software, seeking for greater confidence of consumers must be included. This would allow the e-business to satisfy the needs of potential consumers and increase the number of the loyal and regular clients.

Electronic business companies should have detailed information about customers' needs and their demands. Such information can be obtained by collecting information about transactions made by customers, their most frequently visited sites and by analyzing other appropriate information. It is not always the price that customers are concerned about. Most often customers calculate the total pecuniary expenses during the life cycle of the product while paying very close attention to the quality. Potential customers are also very much interested in the expertise and experiences of a particular electronic business. Very often purchase orders from regular customers are prearranged. Therefore, system's employees can actually forecast customer's future demands and accordingly adjust the range of new products to be supplied. This is one of the main preconditions for enhancing the competitiveness of electronic business. When aiming to ensure successful competition with rivals, it is very important that all available human, technical and monetary resources should be used rationally and reasonably. Excessive expenses for market research and the maintenance of administration offices or the inappropriate number of employed staff can often account for impairment of the company's competitiveness. The competitive capacity increases when companies exist as a combination of conventional and electronic business.

A few illustrative examples are presented. After creating copious knowledge bases including thousands of experts with great experience and expertise, the

service of real estate development advice has been launched online. Real estate developers receive detailed professional advice on different issues and questions related to real estate development are raised online.

Excellent prospects are related to the provision of legal advice for real estate developers. Companies offer to various law firms access to its knowledge bases. There are also a large number of individual lawyers offering inexpensive legal advice on the Internet.

There are many companies and organizations that provide advice in the sphere of management on the basis of accrued experience, professional expertise and created knowledge bases. The company "Anderson Consulting" is considered a leader and innovator in this sphere (www.knowledgespace.com). Most often it is large corporations that use such services because the prices charged for such services are quite high.

More and more companies offer standard insurance services with considerable discounts. Besides, these companies provide customers with the possibility to compare different insurance alternatives and select the best alternative from the available lists.

Very often products are sold and services are provided in different digital markets, which creates additional inconveniencies. For example, when buying construction products customers settle accounts with the manufacturer or supplier, credits are taken out from banks, property is insured by insurance companies and for other services, accounts are settled with other different organizations. Payments for the construction products sold or services provided are made to each organization separately. However, such services within electronic business systems are combined and provided in a more complex way. Currently, customers have the possibility to place orders and to make payments in one place and later all elements of the transaction will be automatically distributed among the appropriate digital markets.

The Web provides the added possibility of looking for employment opportunities. The Internet has various search engines and systems providing information about vacancies. Information placed on such systems can be arranged according to the type of activity, location and other aspects. This form of search is inexpensive and effective both for employers and job seekers. The Internet labor market continues to expand rather rapidly and every year offers millions of job opportunities. A multitude of people both offering and seeking jobs can simultaneously participate in the Internet labor market. The people looking for a job can very quickly have access to information about vacancies, description of particular jobs, requirements, salaries and other additional information. They can also file applications for a job, organize an interview and take tests. By using their agent's services, employers can check CVs and other information about potential employees and find the most suitable job place for a particular

applicant. The large number of available jobs and CVs make it difficult both for employers and employees to search the electronic job market. Intelligent agents are used to solve this problem for both groups. A free service for employees that searches the Internet's top job sites and databases for job postings and based on user's profiles is offered at www.jobsleuth.com. The users receive a daily e-mail containing job opportunities from over a dozen top job sites on the Internet that match their career interests and qualifications. A special search engine helps employers to find a CV that matches job descriptions written by employees. This search for matching CVs is done by intelligent agents such as www.resumix.com. For example, the organization "Brainbench" (www.brainbench.com), taking into consideration the qualifications and working experiences of job seekers, helps to find suitable employees for the employers. Potential employees are provided with the possibility of taking tests and to receive a universally recognized ISO 9001 certificate. On passing their tests in the chosen category (for example, financial analysis and investments) a certificate with the period of validity of 12 months can be obtained. A standard test consists of 40 questions that should be answered within 2 hours. Along with the test's results, information is provided that describes the applicant's qualification and specifying the possible jobs that can be performed within context of the qualifications, including spheres that require certain enhancements.

At the Internet real estate and construction auctions products and services are sold on a competitive basis, which means that a particular item or service will be sold to those who offer the highest bid. Each Internet auction has a page with strict participation rules as well as the main requirements and answers for auction participants. Companies arranges auctions where potential buyers offer the opening bids.

On the site Quicken.com which is a personal finance site (www.quicken.com) customers can settle their insurance issues, receive housing credit, pay taxes, arrange investments and/or be registered into a future retirement allowance fund. Here customers can choose the most competitive type of insurance and assess their financial capacity before buying a property. The system also helps to complete credit application forms and specifies life assurance costs.

The Internet has transformed traditional patterns of firm-to-customer communication and opened new channels through which enterprises can engage with consumers around the world. Yet ways to measure firms' visibility in this electronic marketplace have failed to keep pace with these developments (Levina, Vilnai-Yavetz 2015). Levina and Vilnai-Yavetz (2015) present a new model – the e-visibility maturity (e-VM) model – that can be used to assess the degree to which a firm or set of firms has the potential to engage customers in the global e-business market. The suggested model is developed based on a literature review, an international survey of online customers, and a comprehensive review

of 1868 firm websites representing 27 industries in five countries. After presenting the model, Levina and Vilnai-Yavetz (2015) show how it can be scaled to different levels (e.g., the industry or country level) using three illustrative cases: a set of four countries across industries; a set of four industries across countries; and a set of four individual firms. Levina and Vilnai-Yavetz (2015) found substantial differences in levels of e-visibility and its specific dimensions of interactivity, firm globalization, sociability, and security between the countries and specific firms sampled. The industries sampled all emphasize firm globalization and interactivity. The model offers a simple and reliable way to evaluate a company's adaptation to the challenges of the social web, and can be used by strategists and policy makers at the industry or government level as well as to help firms establish strategies for improving their position in the online marketplace (Levina, Vilnai-Yavetz 2015).

A construction project requires collaboration of several organizations such as owner, designer, contractor, and material supplier organizations. These organizations need to exchange information to enhance their teamwork. Understanding the information received from other organizations requires specialized human resources. Construction cost estimating is one of the processes that requires information from several sources including a building information model (BIM) created by designers, estimating assembly and work item information maintained by contractors, and construction material cost data provided by material suppliers. Currently, it is not easy to integrate the information necessary for cost estimating over the Internet (Niknam, Karshenas 2015).

Since the Internet has become widely available for construction product information (CPI) acquisition, Internet search engines and Internet based CPI providers have rapidly replaced traditional methods such as product catalogs, product manufacturer's distributors, professional magazines, and word of mouth (Lee *et al.* 2011). Lee *et al.* (2011) provide useful knowledge about this emerging Internet-based business of CPI for the stakeholders in the A/E/C industry. Lee *et al.* (2011) investigate the business from three different perspectives; a) the effectiveness of current CPI providers' websites, b) business operation models of this new industry sector, and c) critical factors for the successful operation of the Internet based CPI business using multiple surveys in the U.S. and South Korea. Lessons learned from the multi-layered assessment in this study has been actively applied and incorporated into a new web-based construction production information system which is currently developed through government support in South Korea. Lee *et al.* (2011) study shows that reliable assessments of existing and rapidly growing CPI businesses in developed countries such as the U.S. and England can provide effective guidelines and strategies for successfully implementing this emerging market into different environments of developing countries.

The construction industry recognizes that significant gains can be achieved using e-business. However, e-business platforms need to progress toward new emerging paradigms; beyond the dematerialization of processes, e-business must integrate collaborative tools, support social networking mechanisms, and enhance interoperability between systems in order to improve collaboration, develop trust, and implement strategic approaches to network relationships. The Social e-business concept presented in this paper defines this innovative e-business vision, which integrates web-based collaborative tools, emphasizes the importance of social capital and social networking, and enhances the role of supply chain management. The proposed Satellite Network model fits in with this collaborative working logic, defining a functional approach to enhance the social network behavior in a project-based web platform for the construction industry. A case study is presented demonstrating the implementation of the Social e-business concept and the Social Network model in an innovative electronic platform for the construction industry (Costa, Tavares 2012).

Kong *et al.* (2005) present a new approach to achieving interoperability between Web-based construction products catalogues. It first introduces the current development of electronic catalogues of construction products. The common system architecture of Web-based electronic products catalogues is discussed, which is followed by a discussion on construction products information standardization and the latest distributed-systems technologies for the communication and exchange of construction products information. Kong *et al.* (2005) present a model of interoperable Web-based construction products catalogue and an implementation of Web services in E-commerce systems to enable the sharing of construction products information.

The construction industry in general is characterized with high fragmentation, low productivity, cost and time overruns, and conflicts compared with other manufacturing industries. Supply chain management as an innovative management mode provides a new solution for resolving these problems from systems perspective. Coordination is the core issue to improve construction performance in construction supply chain (CSC) (Xue *et al.* 2007). Xue *et al.* (2007) defined the concepts of CSC and CSC management. Furthermore, the inter-organization problems that effect CSC coordination are identified. Considering the Internet fosters the integration of construction processes and provides an efficient platform for CSC coordination, Xue *et al.* (2007) present two types of Internet-enabled coordination mechanisms: market mechanism, such as auction and contracting, and coordination flow, including information hub and electronic marketplace, for improving construction performance and to accelerate the innovations in the construction industry.

Seeking information from websites has become an essential part of a contractor's procurement undertaking, as more and more procurement websites become

available on the Internet. Websites host extremely large amounts of information; a keyword search, therefore, is often more efficient than browsing via an index. However, in order to find the desired information, it may be necessary to enter keywords using a trial-and-error process. This research recognizes that professional procurement experience can help users search website information more effectively, by using fewer keywords, and so proposes a learning model and suggestion model that can capture such experience, thus guiding inexperienced users in their search. Experiments, evaluating the performance of the system, were also conducted (Dzeng, Chang 2005).

6.4. Data mining and real estate development

Data mining is applied often enough in fields such as decision support system, analytics, predictive analytics, data analysis, data warehouse, business intelligence, exploratory data analysis and web mining.

Decision support systems (DSS) are a specific class of computerized information system that support business and organizational decision making activities. On the other hand, data mining extends the possibilities for decision support by discovering patterns and relationships hidden in the data and therefore enabling an inductive approach to data analysis (Khademolqorani, Hamadani 2013).

The process of knowledge discovery in databases (KDD) is consisting of nine steps (Maimon, Rokach 2010):

1. Developing an understanding of the application domain. The people who are in charge of a KDD project need to understand and define the goals of the end-user and the environment in which the knowledge discovery process will take place.
2. Selecting and creating a data set on which discovery will be performed. Having defined the goals, the data that will be used for the knowledge discovery should be determined. This includes finding out what data is available, obtaining additional necessary data, and then integrating all the data for the knowledge discovery into one data set, including the attributes that will be considered for the process.
3. Preprocessing and cleansing. In this stage, data reliability is enhanced. It includes data clearing, such as handling missing values and removal of noise or outliers.
4. Data transformation. In this stage, the generation of better data for the data mining is prepared and developed. Methods here include dimension reduction (such as feature selection and extraction, and record sampling), and attribute transformation (such as discretization of numerical attributes and functional transformation).

5. Choosing the appropriate Data mining task. We are now ready to decide on which type of Data mining to use, for example, classification, regression, or clustering. This mostly depends on the KDD goals, and also on the previous steps. There are two major goals in Data mining: prediction and description. Prediction is often referred to as supervised Data mining, while descriptive Data mining includes the unsupervised and visualization aspects of Data mining. Most data mining techniques are based on inductive learning, where a model is constructed explicitly or implicitly by generalizing from a sufficient number of training examples.
6. Choosing the Data mining algorithm. Having the strategy, we now decide on the tactics. This stage includes selecting the specific method to be used for searching patterns (including multiple inducers). For example, in considering precision versus understandability, the former is better with neural networks, while the latter is better with decision trees. Thus, this approach attempts to understand the conditions under which a Data mining algorithm is most appropriate. Each algorithm has parameters and tactics of learning (such as ten-fold cross-validation or another division for training and testing).
7. Employing the Data mining algorithm. Finally the implementation of the Data mining algorithm is reached. In this step we might need to employ the algorithm several times until a satisfied result is obtained, for instance by tuning the algorithm's control parameters, such as the minimum number of instances in a single leaf of a decision tree.
8. Evaluation. In this stage we evaluate and interpret the mined patterns (rules, reliability etc.), with respect to the goals defined in the first step.
9. Using the discovered knowledge. We are now ready to incorporate the knowledge into another system for further action. There are many challenges in this step, such as losing the "laboratory conditions" under which we have operated. For instance, the knowledge was discovered from a certain static snapshot (usually sample) of the data, but now the data becomes dynamic. Data structures may change (certain attributes become unavailable), and the data domain may be modified (such as, an attribute may have a value that was not assumed before).

Some examples of application of big data in real estate development are follows.

Du *et al.* (2014) focuses on the present applications of big data in Chinese real estate development and marketing from the perspective of real estate enterprises. The problems in this practice for big data's application are analyzed by now. What's more, the possible solutions to solve the above problems are proposed in this research. It benefits the real estate enterprises to strength their competition with big data technology (Du *et al.* 2014).

Owing to the self-improvement desire, the human being always tries to reach to the current information and generate new ones from the data on hand. The practices are realized by processing and transforming the data, whose existence is broadly accepted, into information. Generating information from data is vitally important in terms of regulating the life. Especially firms need to store and transform data quickly and properly into information in order to achieve the objectives such as having a competitive edge, producing new products, moving the firm ahead and stabilizing the internal dynamics. The increase in the amount of data sources also increases the amount of the data acquired. Therefore storing and processing data become difficult and classical approaches remain incapable to do such transactions. By means of Big Data large amount of data with a wide range can be stored, managed and processed. Besides Big Data ensures proper information quickly and offers advantage and convenience to the firms, researchers and consumers by taking the properties of Volume, Value, Variety, Veracity and Velocity into consideration (Özköse *et al.* 2015). Özköse *et al.* (2015) study consists of 5 parts. In the Introduction part the features, classification, the process, the areas of usage and the techniques of Big Data are explained. In the second part the appearance process and the advantages of the concept of Big Data are illustrated with examples. A detailed literature review is produced in the third part. In the fourth part the future of the Big Data is evaluated. Besides the situation and distribution of the studies on Big Data in Turkey and all over the world is presented. In the Conclusion part, an overall assessment is included and probable troubles are mentioned (Özköse *et al.* 2015).

There is an ongoing debate concerning the disparity between the public and private sectors in relation to construction waste management (CWM) performance: some argue that CWM performance between the two sectors should have no difference since they are under the governance of the same set of CWM related regulations, while others argue that public sector clients should perform better as they are subject to greater social scrutiny. Previous studies comparing CWM performance have suffered from insufficient quality data, leaving the debate on the CWM performance disparity largely inconclusive (Lu *et al.* 2015). Informed by the Coase Invariant Theorem, Lu *et al.* (2015) empirically compares CWM performance between public and private projects. It does so by using big data in the form of 2 million waste disposal records generated from around 5700 projects undertaken in Hong Kong during 2011 and 2012. It is found that there is a notable CWM performance disparity between the public and private sectors, with contractors performing better in managing both inert and non-inert waste in public projects than they do in private projects. Furthermore, the interviews and case studies conducted as part of the research suggest that CWM transaction costs are not high enough to incentivize contractors to manage waste conscientiously and therefore other institutional arrangements, such as promoting the

value of environment protection leadership, are critical for achieving superior CWM performance. The research therefore supports the corollary of Coase Invariant Theorem, which asserts that certain forms of institutions would improve CWM performance by reducing transaction cost even though both sectors are subject to the same set of CWM-related formal public policies (Lu *et al.* 2015).

Building energy data has been used for decades to understand energy flows in buildings and plan for future energy demand. Recent market, technology and policy drivers have resulted in widespread data collection by stakeholders across the buildings industry. Consolidation of independently collected and maintained datasets presents a cost-effective opportunity to build a database of unprecedented size. Applications of the data include peer group analysis to evaluate building performance, and data-driven algorithms that use empirical data to estimate energy savings associated with building retrofits (Mathew *et al.* 2015). Mathew *et al.* (2015) discusses technical considerations in compiling such a database using the DOE Buildings Performance Database (BPD) as a case study. Mathew *et al.* (2015) gathered data on over 750,000 residential and commercial buildings. Mathew *et al.* (2015) describe the process and challenges of mapping and cleansing data from disparate sources. Mathew *et al.* (2015) analyze the distributions of buildings in the BPD relative to the Commercial Building Energy Consumption Survey (CBECS) and Residential Energy Consumption Survey (RECS), evaluating peer groups of buildings that are well or poorly represented, and discussing how differences in the distributions of the three datasets impact use-cases of the data. Finally, Mathew *et al.* (2015) discuss the usefulness and limitations of the current dataset and the outlook for increasing its size and applications.

The operational rating system in building energy performance certificates (EPCs) has been used for systematically monitoring and diagnosing the energy performance in the operation and maintenance phases of existing buildings. However, there are several limitations of the conventional operational rating system, which can be subdivided into three aspects: (i) building category; (ii) region category; and (iii) space unit size (Koo, Hong 2015). To overcome these challenges, Koo and Hong (2015) conducted the problem analysis of the conventional operational rating system for existing buildings by using the statistical and geostatistical approaches. Based on the problem analysis, Koo and Hong (2015) developed the dynamic operational rating (DOR) system for existing buildings by using the data-mining technique and the probability approach. The developed DOR system can be used as a tool for building energy performance diagnostics. To validate the applicability of the developed DOR system, educational facilities were selected as the representative type of existing buildings in South Korea. As a result, it was determined that the developed DOR system can solve the irrationality of the conventional operational rating system (i.e., the negative

correlation between the space unit size and the CO_2 emission density). Namely, the operational ratings of small buildings were adjusted upward while those of large buildings were adjusted downward. The developed DOR system can allow policymakers to establish the reasonable operational rating system for existing buildings, which can motivate the public to actively participate in energy-saving campaigns (Koo, Hong 2015).

In construction industry, work defects yield time and cost overruns of construction projects and also cause disputes between project participants during construction and operation phases. To date, there hasn't yet been an adequate analytical model to extract useful information from the database of construction defects. The information represented in the form of association rules could enhance quality management via defect prediction and causation analysis (Cheng *et al.* 2015). Cheng *et al.* (2015) propose a Genetic Algorithm (GA)-based approach that incorporates the concept hierarchy of construction defects to discover multi-level patterns of defects from the database of defects in the Chinese construction industry during 2000 to 2010. First, the domain knowledge of construction defect is incorporated into a concept hierarchy to adjust mining items at different levels according to the data sparseness and the interestingness of a rule. Second, a GA-based approach is proposed to generate interesting association rules without specified threshold of minimum confidence, taking advantage of the searching capability of GA. Finally, the redundant rules in the mining results are pruned by post-processing method. A test case is selected to demonstrate the feasibility and applicability of the proposed approach within the problem domain. It is concluded that the proposed method provided an effective tool to discover useful knowledge hidden in historical defect cases. The discovered knowledge indicating relationships between defects and defect causes enables project managers to make strategies for estimating and reducing defects (Cheng *et al.* 2015).

Credit scoring model have been developed by banks and researchers to improve the process of assessing credit worthiness during the credit evaluation process. The objective of credit scoring models is to assign credit risk to either a "good risk" group that is likely to repay financial obligation or a "bad risk" group who has high possibility of defaulting on the financial obligation. Construction of credit scoring models requires data mining techniques. Using historical data on payments, demographic characteristics and statistical techniques, credit scoring models can help identify the important demographic characteristics related to credit risk and provide a score for each customer (Yap *et al.* 2011). Yap *et al.* (2011) illustrate using data mining to improve assessment of credit worthiness using credit scoring models. Due to privacy concerns and unavailability of real financial data from banks Yap *et al.* (2011) applies the credit scoring techniques using data of payment history of members from a recreational club. The club

has been facing a problem of rising number in defaulters in their monthly club subscription payments. The management would like to have a model which they can deploy to identify potential defaulters. The classification performance of credit scorecard model, logistic regression model and decision tree model were compared. The classification error rates for credit scorecard model, logistic regression and decision tree were 27.9%, 28.8% and 28.1%, respectively. Although no model outperforms the other, scorecards are relatively much easier to deploy in practical applications (Yap *et al.* 2011).

The 2008 financial tsunami, hitting the globe across all types of industries, causing tides of bankruptcies and severe unemployment, had its epicenter at American subprime in the housing market. In fact, the US subprime storm was just a premonition, while the root cause of the financial tsunami lied in the oversupply of structured credit products. Credit card business, one of the structured credit products, which under an intensively competitive environment, have been released by many banks with high spread, high return, and easy-to-apply appeals to carter to consumers needs. In order to allure the customers, some banks even go to the extent as simplify the credit rating, which in turn has increased credit risk, causing high non-performing ratio, increased debt collection cost, and growing bad debt counts. Accordingly, credit risk auditing plays a vital role in the successful management of credit card business. In response to such needs, the present study aims to conduct analysis and investigation on the current status of the industry with CRISP-DM model. First, customers' demographic data and payment-related statistics were analyzed to identify feature variables, which were then sorted out as demographic data, debt data, payment rating etc. Next, by utilizing artificial neural network of data mining technique, the study tries to predict customer's regular pattern of consumption, payment and/or default and bad debt, and to develop a set of credit granting principle by employing the decision tree technique. Since data mining classification model has a greater power in discriminating credit card granting, it can thus be used to construct accurate credit variable rules and predictive model, to further improve credit checking effect and credit risk control. Using the credit auditing data of a certain bank as a case study, the study intends to verify that the model constructed by the researcher can effectively identify the potential key factors of its credit card granting rule, to minimize the cost loss of Model I and Model II credit business, and eventually enhance the stability and profitability of the bank's credit card business (Chen, Huang 2011).

A comprehensive approach for the evaluation of the economic feasibility of landfill mining (LFM) should take into account not only the direct costs and revenues for the private investor, but also the social benefits or costs (generally called externalities), in such a way that projects generating major social benefits (and no significant private revenues) are not overlooked (Marella, Rag 2014).

With a view to contributing to the development of a common framework for the evaluation of LFM projects, Marella and Rag (2014) present the results of a case study where the issue of the assessment of social benefits from a LFM project is addressed. In particular, the Contingent Valuation Method is applied for the monetary assessment of the community-perceived benefits from the remediation of an old uncontrolled waste deposit by means of LFM and the conversion of the area into a park. Based on the results of a survey carried out on a random sample of people living near the old landfill, the economic values of the individual willingness to pay (WTP) for LFM and the subsequent creation of a public park were calculated and the correlations with the relevant variables (distance from the landfill site, age, income, sex, education level) assessed. The results were then suitably extended and the monetary value of the welfare increase of the whole population resident in the area and potentially affected both by LFM and the creation of the park was calculated (Marella, Rag 2014).

Hornick *et al.* (2007) explore various business problems that are common to many industries and that can be addressed with a strategy based on data mining. Hornick *et al.* (2007) further identifies and discusses several cross-industry solutions, where data mining plays a central role. The solutions discussed by Hornick *et al.* (2007) are customer acquisition, customer retention, response modelling, fraud detection, cross-selling, new product line development, survey analysis, credit storing, warranty analysis, and defect analysis. Understanding such common data mining scenarios is a beginning for identifying uses of data mining in individual application domains. Hornick *et al.* (2007) also highlights several industries and their particular uses of data mining. Each of these industries can apply the cross-industry solutions, cited and tailored to their own domain-specific needs. Hornick *et al.* (2007) also reveals that data mining‘s benefits can be leveraged by companies both big and small, from large financial institutions to local car dealerships, those with millions of customers and those with hundreds, and those with scientific as well as manufacturing process data analysis needs.

Problem-solving processes in value management (VM) workshops in the construction industry are experience-based, and the quality of these workshops depends very much on the experience of the team members. The efficiency and effectiveness of VM workshops can be improved by better reusing the experience of previous VM cases and field knowledge (Shen *et al.* 2008). Shen et al. (2008) describe a new approach to facilitate VM workshops in the construction industry using data mining (DM) techniques. The feasibility of integrating DM techniques with VM workshops in the construction industry is demonstrated in case studies. Examples are presented to illustrate different methods of applying DM tools in VM workshops. The results show that DM techniques can help team members in VM workshops to understand their problems more clearly and to generate more ideas for current problems (Shen *et al.* 2008).

6.5. Text analytics and real estate development

The types of statements that are emphasized by many scientists and practitioners in their discussions on the interrelationship between text mining and text analytics are akin to the following. “The application of text mining techniques to solve business problems is called text analytics.” “Text mining, which is sometimes referred to text analytics –” “Text analytics are also known as text mining.” “Text mining is roughly equivalent to text analytics” “Text Analytics is also known as Text Mining” “Text mining, also referred to as text data mining, roughly equivalent to text analytics –” “The application of text mining techniques to solve business problems is called text analytics.”

Rao and Dey (2011) hold the opinion that text mining is an interdisciplinary field that brings together concepts from statistics, machine learning, information retrieval, data mining, linguistics and natural language processing. In many ways text mining is similar to data mining, and indeed regarded by some as an extension of the same. The main point of departure from the parent discipline of data mining is in the type of data that needs to be analyzed. Whereas data mining deals with mostly numeric structured data, text, the theme of text mining, is regarded as “unstructured” data. Though the task of text mining based DSS would seem to be more challenging than that of mining of structured data, the existence of vast amounts of information in electronically available text has led to intense research in text mining techniques, and many of the challenges have been overcome (Rao, Dey 2011).

With an exponential growth in the amount of unstructured data, text mining is becoming a part of mainstream decision support technology rather than a luxury. As text-mining tools mature, they become better integrated in existing decision support processes and systems. The acceptance of text mining is growing at an accelerating pace. In combination with sound structured data analysis and reporting techniques, text mining becomes a strong competitive advantage for early adopters of this new decision support technology (Froelich, Ananyan 2008). Froelich and Ananyan (2008) deliberate various decision support via text mining technologies (tokenization, morphological analysis, quality improvement using string similarity, part of speech tagging, collocation analysis, named entity recognition, word association, summarization and concept analysis, classification, clustering, dictionaries). Several decision support via text mining technologies are presented next in-brief (Froelich, Ananyan 2008):

- Word Association. Word association involves the identification and representation of a relationship between any two words or phrases or entities. This type of association in product returns is a keymetric in identifying what influences customer purchase decisions. Analyzing word association can lead to a better understanding of key relationships in text.

- Summarization and Concept Analysis. Document summarization refers to the automated delivery of a concise representation of the contents of a document. Keyword extraction, or concept extraction, is the process of finding the best keywords or phrases which represent a set of documents. Keywords are typically conflated morphologically (inflected forms are merged) and ranked according to some measure of importance such as statistical significance, frequency, or term document frequency, or by the document count. The list of words is filtered by comparing words against a dictionary of words to ignore. A thesaurus may be supplied to provide synonyms that can be used to re-weight terms based on the term frequency and the net frequency of all the term's synonyms. Keyword extraction is one of the final outputs found in most text-mining applications. Along with keywords, summaries can be provided with search results to facilitate better and faster information retrieval. This task is dependent upon accurate weighting of concepts within the text.
- Classification. Document classification is the training of a classification model to assign documents to known categories. The first step is feature extraction, which is equivalent to finding the words or phrases that best represent a document, analogous to tokenization and summarization. Next, depending on the algorithm, specific keywords, frequencies, and other information are used to split the data or group the data according to mathematical or logical rules. The categories can be hierarchical to show a higher level of organization in the topics.
- Clustering. Text clustering places documents into groups based on a measure of similarity. Common algorithms include nearest neighbor and expectation maximization. Divisive clustering algorithms work from the top down, splitting a cluster into smaller clusters. Agglomerative clustering algorithms work from the bottom up, grouping together clusters into hierarchies. This process is similar to building a dendrogram, a tree-like graph of a hierarchy. Unlike text classification, clustering algorithms are not aware of the desired set of categories. The output of the clustering can be used, like keyword extraction or summarization, to obtain the gist of a set of documents at a glance.
- Semantic Analysis. Semantic analysis is the culmination of basic linguistic and statistical processing techniques to perform a deeper analysis of text. Application domains such as competitive intelligence rely on the ability to identify names of people or places in documents in order to identify correlations and trends.

This section will close by providing practical examples for the use of text mining in real estate development and the constituent parts of the process in question.

The occurrences of construction accidents can be reduced but cannot be avoided because of risky and uncertain nature of construction works. Construction accidents tend to cause serious damages, injuries, fatalities, and work interruptions, and provoke disputes among the involved parties. One useful means for resolving the dispute through alternative dispute resolution, instead of costly litigation, is to find similar accidents occurring in the past in the same jurisdiction and compare their similarities and differences (Fan, Li 2013). Fan and Li (2013) introduce a research project on the effective retrieval of relevant historical cases from a case library using text mining techniques. Research issues in the text mining process, especially how to represent the unstructured textual cases by a structured term vector model, are investigated. It is concluded that natural language based case document retrieval is superior to the case-based reasoning from structured case collection and is more practical for implementation in a construction management information system (Fan, Li 2013).

The proliferation of good urbanization practices around the world has led to an imperative need to share these experiences. However, these good practice cases relate to different and specific contexts, making it difficult to effectively apply these experiences to other cases. It is appreciated that no existing method is available to guide us into refining these experiences so that they can be adopted in new urbanization scenarios. This method-shortage presents a major barrier to the sharing of good experiences between cities in promoting sustainable urbanization (Shen *et al.* 2013). Shen *et al.* (2013) present an Experience Mining System (ExMS) for effectively extracting previous urbanization practice experiences. ExMS is built based on the theories of experience representation, storage and mining. Its major components include a Sustainable Urbanization Practices Database (SUPD), a Refinery process, and a Mine-sweeper. ExMS can facilitate decision-makers in the selection of strategies and solutions when addressing urbanization practice challenges (Shen *et al.* 2013).

Most advanced text analytics and text mining tasks include text classification, text clustering, building ontology, concept/entity extraction, summarization, deriving patterns within the structured data, production of granular taxonomies, sentiment and emotion analysis, document summarization, entity relation modelling, interpretation of the output. Already existing text analytics and text mining cannot develop text material alternatives (perform a multivariant design), perform multiple criteria analysis, automatically select the most effective variant according to different aspects (citation index of papers (Scopus, ScienceDirect, Google Scholar) and authors (Scopus, ScienceDirect, Google Scholar), Top 25 papers, impact factor of journals, supporting phrases, document name and contents, density of keywords), calculate utility degree and market value. However, the Text Analytics for Android Project can perform the aforementioned functions. To the best of the knowledge herein, these functions

have not been previously implemented; thus this is the first attempt to do so (Kaklauskas *et al.* 2014).

Wang I. (2015) investigate the correlation between mutual funds' scale and return in China by text mining on the sheer volume of online financial reports. Wang *et al.* (2015) crawl the webpages of all Chinese open-end mutual funds from a well-known financial website, which are then parsed to obtain time-series data of fund scales and returns. Wang *et al.* (2015) argue that with long-tail distribution of fund scales, to examine the correlation directly in an individual level is not appropriate; rather, we should consider it in a group level by scales and take different market conditions into consideration. To illustrate this, Wang *et al.* (2015) start with a data-fitting test to demonstrate that the tail of fund scale fits best in a distribution between Power-Law and Log-Normal. Hence, to categorize mutual funds by equal scale could lead to fund groups in substantially different sizes, and the subsequent results are thus prone to bias. Wang *et al.* (2015) therefore introduce K-means clustering for fund categorization, which enables reliable examination of correlations between fund scale and return. Empirical study unveils some interesting findings on the scale effect of funds under different market conditions. These findings highlight the uniqueness of emerging markets while providing interesting guidelines for exploiting big data analytics for financial studies (Wang *et al.* 2015).

6.6. Web-based decision support systems created by authors in cooperation with their associates

6.6.1. Introduction

One of the major problems in Web-based systems and e-business is to find what you want. The number of alternative products and services on the internet are in the thousands. How can customers find the rational products and services on the internet? Once product or service information is found, the customer usually wants to compare alternatives. There are five types of aids to comparison shopping:

- Search on hypertext files by agents. Agents can find alternatives with relating information (list prices, and other characteristics), seller's address, and search for minimally priced products.
- Search alternatives on databases. Many electronic catalogues built using a Dynamic Web-based Database Management system exist today. The software agents are computer programs that help users to conduct routine tasks, search and retrieve information, support decision-making, and act as domain experts without human intervention. Software agents can find products and make direct comparisons between products from the database.

- Alternative search and tabular comparison. Alternatives can be found and carry out tabular multiple criteria comparisons.
- Comparison of alternative products and services from multiple malls.
- Search and multiple criteria decision-making. The multiple criteria decision-making methods and multiple criteria decision support systems are used in this type of e-business comparison shopping.

Many internet based systems are processing and submitting only economic information for decisions. Alternatives under consideration have to be evaluated not only from the economic position, but take into consideration qualitative, technical and other characteristics. Therefore, the efficiency of e-business and Web-based systems may be increased by applying multiple criteria decision support systems. The above decision support systems comprise of the following constituent parts: a data (database and its management system), models (model base and its management system) and a user interface.

When creating the Web-based decision support systems the authors based their work on the following major principles and methods:

- Method of complex analysis. The use of a complex analysis makes it possible to carry out economic, technical, qualitative, technological, environmental, managerial and other kinds of optimisation throughout the life cycle of a project.
- Method of functional analysis. The expenditures associated with project functions are usually determined by taking into account the benefits of a function and the cost of its realization.
- Principle of cost-benefit ratio optimisation. Efforts are made to get maximum benefit (economic, qualitative, environmental and social, legal, etc.) at minimum project's life cycle expenses, i.e. to optimise the cost-benefit ratio.
- Principle of interrelation of various sciences. The problem of cost-benefit ratio may be successfully solved only when the achievements of various sciences, such as management. economics, law, engineering, technology, ethics, aesthetics and psychology, etc. are used.
- Methods of multi-variant design and multiple criteria analysis. These methods allow us to take into consideration the quantitative and qualitative factors, as well as cutting the price of the project and better satisfying the needs of all interested parties.
- Principle of close interrelation between project's efficiency and interested parties and their aims.

Presentation of information in databases may be in conceptual (digital, textual, graphical, virtual and augmented reality, photographic, video) and quantitative forms.

Conceptual information means a conceptual description of alternatives, the criteria and ways of determining their values and weight. Conceptual information is needed to make more complete and accurate analysis of the alternatives considered. In this way, the above DSS enable the decision maker to receive various conceptual and quantitative information on alternatives from a database and a model-base allowing him/her to analyze the above factors and form an efficient solution.

Quantitative information presented involves criteria systems and subsystems, units of measurement, values and initial weight fully defining the variants provided. Quantitative information of alternatives is submitted in the form of grouped decision-making matrix, where the columns mean n alternatives under analysis, and rows include quantitative information.

The databases were developed providing a multiple criteria analysis of alternatives from economical, legislative, infrastructure, social, qualitative, technical, technological and other perspectives. This information is provided in a user-oriented way. To design the structure of a database and perform its completion, storage, editing, navigation, searching, and browsing, a database management system was used in this research.

DSS store and processes information and data from various sources. By using different multiple criteria analysis models it provides the decision-maker with information necessary for analysing, compiling and evaluating the possible decision alternatives, making decisions and effecting the output and storage of the obtained results. The developed DSS enable consumers to transform unprocessed data into information necessary for the analysis of a particular problem and to be used for further decision-making.

DSS provide a framework through which decision-makers can obtain the necessary assistance for a decision through an easy-to-use menu system. Above, DSS provide help in formulating alternatives, accessing data, developing models and interpreting their results, selecting options or analysing the impacts of the selection made.

Since the analysis of alternatives is usually performed by taking into account economic, quality, technical, legal, social and other factors, a model-base should include models which enable will a decision maker to carry out a comprehensive analysis of the variants available and make a proper choice. The following methods and models developed by authors are aimed at performing the next functions:

- A method and model for criteria weight establishment. A new method of complex determination of the weight of the criteria, taking into account their quantitative and qualitative characteristics was developed. This method allows calculation and co-ordination of the weight of quantitative and qualitative criteria according to the above characteristics.

- A method and model for multiple criteria analysis and setting priorities. A new method of multiple criteria complex proportional evaluation of the alternatives, enabling the user to obtain a reduced criterion determining complex (overall) efficiency of the alternatives was suggested. This general criterion is directly proportional to the relative effect of the values and weight of the criteria considered of alternatives' efficiency.
- A method and model for the determination of alternatives utility degree and market value. In order to find the price that will make a value alternative competitive on the market, a method of determining the utility degree and market value of alternatives based on the complex analysis of all their benefits and drawbacks was suggested. According to this method the alternatives utility degree and the market value of a alternatives being estimated, are directly proportional to the system of the criteria, adequately describing alternatives and the values and weight of criteria.

According to the user's needs, various models may be provided by model-base management systems. When a certain model (i.e. determining the initial weight of the criteria) is used the results of the calculations obtained become the initial data for other models (i.e. a model for multiple criteria analysis and setting the priorities). Results of the latter, in turn, may be taken as the initial data for other models (i.e. determining alternatives utility degree, determining alternatives market value) without human interference.

The model-base management systems provide the user with model bases allowing him/her to modify the models available, eliminating those which are no longer needed and adding some new models linked with the existing ones.

In order to check the accuracy of the developed DSS, the whole of its solution process has been more than once checked manually. The results of manual and computer calculations must match. All separate working stages of the system as well as all complex calculations have been co-ordinated with experts in this field – i.e. the essence of the calculations has been found to be in conformity with their logical reasoning. Owing to suggestions from these experts, useful changes have been introduced into the system. Checking by the experts is bound to the fact that universal decision-making methods are not always suitable for specific tasks and can lead to gross errors or to bad results.

Then, a brief study of the web-based DSS developed by the above authors follows.

6.6.2. Electronic information retrieval model and system for the android project

6.6.2.1. Introduction

Research shows that various scientists have specialised in depth the different and very important areas of text analysis (Babbie 2008; Loshin 2013; Li, Wu 2010; Li *et al.* 2011; Guo *et al.* 2010; Wilson 2009; Yu *et al.* 2008; Lloret, Palomar 2012), entity recognition and extraction (Sobhana 2010; Yang *et al.* 2008; Nothman *et al.* 2013; Loshin 2013), retrieval systems (US Patent No. 5297042, US Patent US 2006/0047656 A1), intelligent libraries (Du 2012; Li *et al.* 2012; Ropero *et al.* 2012; Chen 2008).

Babbie (2008) defines content analysis as the study of recorded human communications, such as books, websites, paintings and laws. According to IT Glossary, text analytics is the process of deriving information from text sources; it is used for several purposes, such as: summarization (trying to find the key content across a larger body of information or a single document), sentiment analysis (what is the nature of commentary on an issue), explicative (what is driving that commentary), investigative (what are the particular cases of a specific issue) and classification (what subject or what key content pieces does the text talk about).

A brief analysis of several parts of the text analysis follows.

Text analysis implies the need for concept taxonomies in which like terms can be collected and aggregated at different levels of precision, such as car makes, models. Algorithms for entity recognition, entity extraction, and text analysis need to be more sophisticated in relation to the text's structure. While simple, pattern-based unstructured entities (such as telephone numbers) can be scanned using techniques such as regular expression parsing, more complex pattern and context sensitive techniques are increasingly used. A standard for content analytics called the Unstructured Information Management Architecture (UIMA) was established by OASIS in 2009 (Loshin 2013).

Text analysis components allow you to analyze documents and identify terms that appear with relative frequency, identify statistically improbable terms, determine sentinel or signal terms, build concept hierarchies, create dictionaries, and document rules for phrase recognition and for concept extraction, among other techniques. Once this analysis is completed, the information contained within the documents can be clustered, categorized, and organized to support intelligent searches, and filtering concepts from streaming text helps identify important text artifacts that can be routed directly to individuals with a particular interest in the supplied content. Once the concepts have been ordered, identified, extracted, and organized, they can be subjected to data mining and other types of analysis to help the knowledge worker draw conclusions from actionable information (Loshin 2013).

Named-entity Recognition (NER) is a key part of information extraction system. NER involves identification of proper names in texts and their classification into a set of predefined categories of interest. Different categories are usually person names, location names, organization names, date & time expressions etc. A variety of techniques has been used for NER. The different approaches to NER include (Sobhana 2010):

- Linguistic approaches. The linguistic methods usually use rules manually written by linguists.
- Machine learning based approaches. Machine learning approaches are trainable and are thus much cheaper than that of rule-based ones. Some of the machine learning techniques used for the NER tasks are hidden markov model, Maximum Entropy Markov Model, Conditional Random Fields.
- Hybrid systems. Hybrid (for example, combination of MaxEnt, hidden markov model and handcrafted rules for make creating NER) systems have been generally more effective for NER.

Entity recognition and extraction builds on natural language processing concepts coupled with semantics and taxonomies to expose explicit relationships (such as an individual's affinity for a particular charity), causal relationships (such as correlation of product issues within geographical regions), or multiple references to the same entity (such as the introduction of pronouns like "He" or "It" that refer to named entities with proper nouns such as "George Washington"). It also requires matching string patterns to items within organized hierarchies (such as recognizing that "electric drill" is a concept contained within a set of items referred to as "power tools"). Real-time identity recognition enables rapid linkage between individuals and their related attributes, characteristics, profiles, and transaction histories, and can be used in real-time embedded predictive models to enhance operational decision-making (Loshin 2013).

There is a known document retrieval system that includes an inputting unit for inputting a retrieval condition that includes one keyword or a plurality of them along with a weight value for each keyword. It also includes an operating unit having first factors corresponding to relationship values with each relationship value being defined as a degree of the relationship between two keywords from the predetermined keywords in the document retrieval system and second factors corresponding to importance values, whereby each importance value is defined as a degree of the importance of a keyword in each one of a plurality of documents predetermined in the document retrieval system. The operation unit generates a relevance value, which represents a degree of relevance for satisfying the user's requirement, for each of the documents on the basis of the retrieval condition inputted from the inputting unit, first factors and second factors and an outputting unit for outputting the relevance value for each document as retrieval results (US Patent No. 5297042).

There is a known, computer-readable code system and Method for retrieving one or more selected text materials from a library of documents. The system processes a user-inputted search query representing the content of the text to be retrieved and it accesses a word index for the documents to identify those text materials in the database having the highest word-match scores with the search query. The weights of words in the query may be adjusted to optimise the search (US Patent Application US 2006/0047656 A1).

Currently authors participated in the Android (Academic Network for Disaster Resilience to Optimise educational Development) project. Android project is being carried out with the financial assistance of the EU Life Long Learning programme, under the Erasmus networks action. ANDROID is concerned with what resilience is, what it means to society, and how society might achieve greater resilience in the face of increasing threats from natural and human induced hazards.

The purpose of this research was to develop an Concept-based Information Retrieval System for the Android project that would be more flexible and more informative in selecting out and integrating rational electronic information by the desired area as much as by coverage and that would allow the actual users to participate and have an influence during the operation by automatically designing, evaluating and selecting the most suitable information for themselves. The developed System is also practically used in two distance MSc study programmes of Vilnius Gediminas Technical University (Real Estate Management; Construction Economics and Business).

Already existing intelligent libraries, text analysis, entity recognition and extraction, retrieval systems cannot develop training material alternatives (perform a multivariant design), perform multiple criteria analysis, automatically select the most effective variant, calculate utility degree and market value. However, the Electronic Information Retrieval Model and System for the Android Project can perform the aforementioned functions. To the best of the knowledge herein, these functions have not been previously implemented; thus this is the first attempt to do so.

6.6.2.2. Bag of concepts space

Concepts are the constituents of thoughts. Consequently, they are crucial to such psychological processes as categorization, inference, memory, learning, and decision-making. The three main options are to identify concepts with mental representations, with abilities, and with Fregean senses (Stanford Encyclopedia of Philopsophy):

- Concepts as mental representations, where concepts are entities that exist in the brain. The first of these views maintains that concepts are psychological

entities, taking as its starting point the representational theory of the mind (RTM). According to RTM, thinking occurs in an internal system of representation. Beliefs and desires and other propositional attitudes enter into mental processes as internal symbols. According to Peacocke (1992), it is possible for one and the same concept to receive different mental representations in different individuals.

- Concepts as abilities. Concepts are abilities that are peculiar to cognitive agents.
- Concepts as Fregean senses. Sense has a unique perspective on its referent—a unique mode of presentation.

Psychologists explore concepts such as perception, cognition, attention, emotion, phenomenology, motivation, brain functioning, personality, behavior, and interpersonal relationships (Psychology on Freebase).

In information science, formal concept analysis is a principled way of deriving a concept hierarchy or formal ontology from a collection of objects and their properties. Each concept in the hierarchy represents the set of objects sharing the same values for a certain set of properties; and each sub-concept in the hierarchy contains a subset of the objects in the concepts above it (Babylon).

Concepts, the mental categories used to organize events and objects, are often arranged in hierarchical order from general to more specific – for example, organism, animal, vertebrate, quadruped, dog, collie (CliffsNotes 2013).

Psychologist Abraham Maslow first introduced his concept of a hierarchy of needs in his 1943 paper "A Theory of Human Motivation" and his subsequent book Motivation and Personality. This hierarchy suggests that people are motivated to fulfill basic needs before moving on to other, more advanced needs. This hierarchy is most often displayed as a pyramid. The lowest levels of the pyramid are made up of the most basic needs, while the more complex needs are located at the top of the pyramid. Abraham Maslow believed that these needs are similar to instincts and play a major role in motivating behavior. There are five different levels in Maslow's hierarchy of needs (Cherry 2013):

- Physiological Needs. These include the most basic needs that are vital to survival, such as the need for water, air, food, and sleep. Maslow believed that these needs are the most basic and instinctive needs in the hierarchy because all needs become secondary until these physiological needs are met.
- Security Needs. These include needs for safety and security. Examples of security needs include a desire for steady employment, health insurance, safe neighborhoods, and shelter from the environment.
- Social Needs. These include needs for belonging, love, and affection. Relationships such as friendships, romantic attachments, and families help fulfill this need for companionship and acceptance, as does involvement in social, community, or religious groups.

- Esteem Needs. After the first three needs have been satisfied, esteem needs becomes increasingly important. These include the need for things that reflect on self-esteem, personal worth, social recognition, and accomplishment.
- Self-actualizing Needs. This is the highest level of Maslow's hierarchy of needs. Self-actualizing people are self-aware, concerned with personal growth, less concerned with the opinions of others, and interested fulfilling their potential.

A number of academics in the world analyzed concept-based information retrieval (Styltsvig 2006; Yi, Allan 2009; Grootjen, van der Weide 2006) and bag of concepts in Wikipedia representation (Hu *et al.* 2008; Huang *et al.* 2008; Milne, Witten 2008; Gabrilovich, Markovitch 2007; Sorg, P. Cimiano 2012).

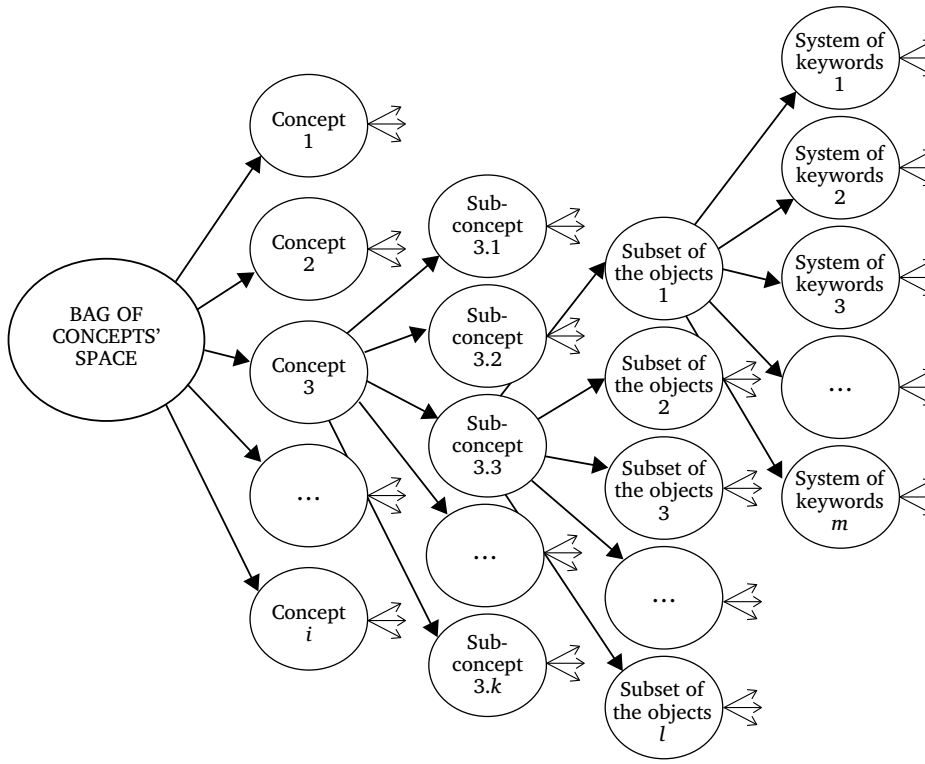


Figure 6.1. Bag of concepts space as a hierarchical weighted tree structure

In general, information retrieval research and technology can be divided into two broad categories: semantic and statistical. Information retrieval systems that fall into the semantic (Auxiliary structures, Local co-occurrence statistics, Transform techniques (particularly matrix decompositions)) category will attempt to implement some degree of syntactic and semantic analysis of the

natural language text that a human user would provide. Systems that fall into the statistical category will find results based on statistical measures of how closely they match the query. However, systems in the semantic category also often rely on statistical methods to help them find and retrieve information (Greengrass 2000).

After the concept is categorised, it can be given the definition by a classification process. Classification is determining where in the conceptual structure a new concept belongs. For this purpose, either an existing conceptual structure (like dictionary, thesaurus or ontology) or automatically generated one can be used. It is reported in many papers that pre-existing dictionaries often do not meet the user's needs for interesting concepts, or ontology like WordNet does not include proper nouns. The main types of conceptual structures used in concept-based information retrieval systems are as follows: Conceptual taxonomy, Formal or domain ontology, Semantic linguistic network of concepts, Thesaurus, Predictive model (Haav, Lubi 2001).

In our research, the bag of concepts space (including synonyms and retrieval restrictions) is represented as a hierarchical weighted tree structure. Bag of concepts space, divided into individual concepts, occupies the top level. The concepts are subdivided into sub-concepts which, in turn, contain subsets of the objects. A subset of the objects is defined by system of keywords (see Figure 6.1). All components in the bag of concepts space are interrelated, weighted and form an integrated whole.

The next step is to develop a system of concepts, taking the bag of concepts space "Disasters" as an example. By concept we mean a single Wikipedia article. Wikipedia's category "Disasters" includes different concepts, namely Earthquakes, Floods, Heat waves, Landslides, Storm, Tsunamis, Climate change, Meteorological disasters, etc. As suggested by experts, we have also added seven qualitative crisis-management concepts from Wikipedia categories to the bag of concepts space, namely Education, Social, Culture, Ethics, Psychology, Emotion, Security (see Figure 6.2). Thus the system of selected quantitative and qualitative concepts presents a comprehensive description of the bag of concepts space word "Disasters". Even without an analysis of available literature related to the bag of concepts, it will be spontaneously obvious to the majority of people that these concepts are important to the word "Disasters". The bag of concepts' (including synonyms and retrieval restrictions) labels also show a level of semantic connection and relatedness to the input title that extends simple synonymy.

Other levels in the bag of concepts space (BCS) are built likewise. The Wikipedia's category "Earthquakes" is divided into the following main categories as shown in Figure 6.2: earthquakes by continent, earthquakes by country, bridge disasters caused by earthquakes, deaths in earthquakes, earthquake engineering, seismic zones, types of earthquake, earthquake templates, earthquake stubs,

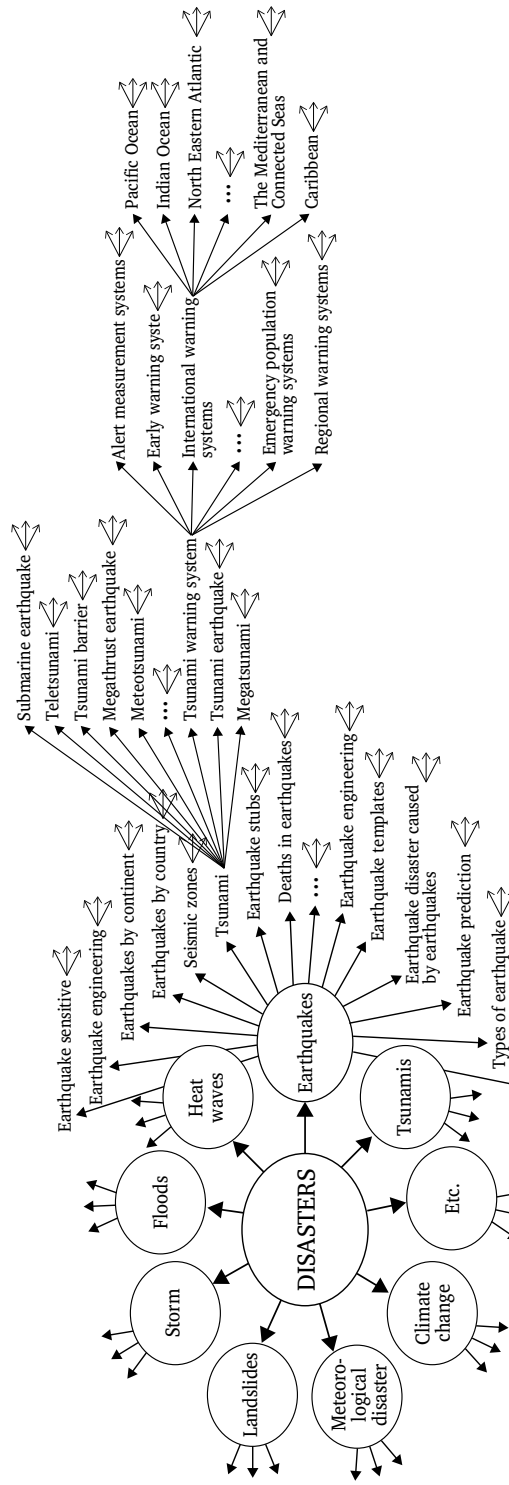


Figure 6.2. Development of the BCS concepts and interrelations between its various levels

earthquake prediction, earthquake sensitive, global earthquake model. These categories are allocated hereafter into upwards detailed categories and concepts. Figure 6.2 shows the tree organization of the bag of concepts space "Disasters", showing a break down of branch within the top-level concept of disasters. In the illustration, the category of Pacific Ocean belongs to the concept of international warning systems, which is a part of the more general concept of Tsunami warning systems, which is part of the even more general concept of tsunami, etc.

The weighted tree structure, thus, provides a comprehensive description of the target of search, this way establishing linkages and relationships among the concepts (including synonyms and retrieval restrictions) in question. Weights are set for the entire bag of concepts space. The weights represent search objectives and experience of various users. Chapters and subchapters in modules are also ranked by their difficulty in the module's context.

Search volume is non-fixed, i. e., a search can be as long as required (a sentence, a paragraph, or even more can be submitted as a search).

By implication, Wilson (2009) described a multi-level bag of concepts space, drawing on neo-Marxian example. The example is briefly discussed below. According to Wilson (2009), geographers currently apply multiple interpretations to how text made and used is powerful. Two prominent takes are most influential: neo-Marxian and neo-Foucaultian. Marxists posit intimate connections between text and the deploying of class power in diverse and variegated capitalist settings. Here, text helps construct understandings of the world that builds social realities (e.g., social relations, class categories, gender fractions, and racial groupings), state formations (e.g., economic programs, fiscal policies, and government redistributive schemes), and material realities (e.g., landscapes, cities, neighborhoods, and nations). Text here is a profoundly relational element. Text always needs to be understood against the realities of societal organization, prevailing class dynamics, and the imperatives of capital accumulation (Wilson 2009).

The pursuit of efficient knowledge may be also analysed from a range of various psychological, moral and philosophy conceptions (good, evil, utility, necessity, abuse, violence, interestingness, doubts and so on). Next, the article presents a few thoughts/conceptions on these aspects by some most prominent world's philosophers, writers and poets such as Socrates (470–399 BC), Democritus (460–370 BC), Plato (427–347 BC), Aristotle (384–322 BC), Leonardo da Vinci (1452–1549), George Savile (1633–1695), George Berkeley (1685–1753), Anatole France (1844–1924), Elbert Hubbard Hubbard (1856–1915), Johann Wolfgang von Goethe (1749–1832), and Friedrich Nietzsche (1844–1900).

The keystone idea is that building up unnecessary knowledge is a useless effort. Democritus (460–370 BC) advises against attempts to know everything in order not to become ignoramus. Plato (427–347 BC) thinks that ignorance is not the greatest of evils; it is much more harmful to dabble in all things without

much thought. Aristotle (384–322 BC) was sure that one must learn those useful things which are really necessary, but not all things. George Savile (1633–1695) believed that weak men are the worse for the good sense they read in books because it furnisheth them only with more matter to mistake.

In several dialogues, Socrates floats the idea that knowledge is a matter of recollection (Forrest, Kaufmann 2008). Later in the Meno, Socrates uses a geometrical example to expound Plato's view that knowledge in this latter sense is acquired by recollection (Scott 2006). In an invented dialogue between Socrates and his student Meno Greek philosopher Plato suggests that the soul is immortal, and repeatedly incarnated; knowledge is actually in the soul from eternity, but each time the soul is incaranated its knowledge is forgotten in the shock of birth. What one perceives to be learning, then, is actually the recovery of what one has forgotten. In neoplatonism the idea of psychic memory was used to demonstrate the celestial and immaterial origins of the soul, and to explain how memories of the world-soul could be recalled by eyeryday human beings. As such, psychic recollection was intrinsically connected to the Platonic conception of the soul itself. Since the contents of individual "material" or physical memories were trivial, only the universal recollection of Forms, or divine objects, drew one closer to the immortal sense of being (Anamnesis 2011).

Many distinguished figures emphasize that the process of acquisition of knowledge must be interesting: in order that knowledge be properly digested it must have been swallowed with a good appetite (Anatole France 1844–1924); just as eating against one's will is injurious to health, so studying without a liking for it spoils the memory, and it retains nothing it takes in (Leonardo da Vinci 1452–1549); the ideal teacher is one who is able to bring out and develop the good that is in the pupil – him we will crown with laurel (Hubbard 1856–1915).

Philosophy being nothing else but the study of wisdom and truth, it may with reason be expected that those who have spent most time and pains in it should enjoy a greater calm and serenity of mind, a greater clearness and evidence of knowledge, and be less disturbed with doubts and difficulties than other men. Yet so it is, we see the illiterate bulk of mankind that walk the high-road of plain common sense, and are governed by the dictates of nature, for the most part easy and undisturbed. To them nothing that is familiar appears unaccountable or difficult to comprehend. <…> But no sooner do we depart from sense and instinct to follow the light of a superior principle, to reason, meditate, and reflect on the nature of things, but a thousand scruples spring up in our minds concerning those things which before we seemed fully to comprehend (George Berkeley 1685–1753).

Even the seeker of knowledge operates as an artist and glorifier of cruelty, in that he compels his spirit to perceive against its own inclination, and often enough against the wishes of his heart: he forces it to say Nay, where he would

like to affirm, love, and adore; indeed, every instance of taking a thing profoundly and fundamentally, is a violation, an intentional injuring of the fundamental will of the spirit, which instinctively aims at appearance and superficiality, even in every desire for knowledge there is a drop of cruelty (Friedrich Nietzsche 1844–1900).

The history of philosophy, of the sciences, and of religion all show that opinions can spread en masse, but the ones that always prevail are those that are more easily grasped, i.e., are most conformable and comfortable to the human mind in its common condition (Goethe 1749–1832).

By paraphrasing the above quotes to reflect the theme of the electronic information retrieval, an emphasis may be placed on the Intelligent Model as a necessary tool for anyone search information and knowledge. The model will serve the needs of a user seeking information and knowledge better.

6.6.2.3. Concept-based information retrieval model

The essence of this research involves the Concept-based Information Retrieval Model that is designated to select the most rational, integrated text material from a library of documents. It covers the inputting of bag of concepts space; selecting, processing and indexing information in accordance with the inputted bag of concepts space and User Model; formulating the results of the retrieval and finally showing them to the user. Further, after selecting, processing and indexing documents, it covers the selecting out of composite parts (chapters/sections/paragraphs) of the documents under analysis and, after that, performing the multi-criteria analysis of the composite parts. This is followed by the designing of alternative variants of the selected information and performing a multi-criteria analysis of the summarised integrated alternatives of the text by which the retrieval results are then formulated (see Figure 6.3).

Once the selecting, processing and indexing of information has been completed, the selecting out of the composite parts of the documents and their multi-criteria analysis are performed. Further alternative variants are designed, these are analysed and the most rational alternative is selected. All this makes the retrieval system more flexible and more informative, since it selects out electronic information as much by area as by coverage.

The multi-criteria analysis of the most rational text materials from a library of documents under analysis covers the complex determination of criteria weights taking into account their quantitative and qualitative characteristics. It includes a multi-criteria evaluation of the text materials defining the utility and market value of the text materials.

Concept-based Information Retrieval Model permits selecting the maximally rational information in the coverage that the user desires. The designing of alternative variants provides the user with an opportunity to supplement and/or

correct the already inputted bag of concepts space, modify the weights and then repeat the search. In other words, the user by using User Model is provided an opportunity to intervene in the occurring retrieval and to redirect it; thus the retrieval takes into account the user-selected priorities and the existing situation.

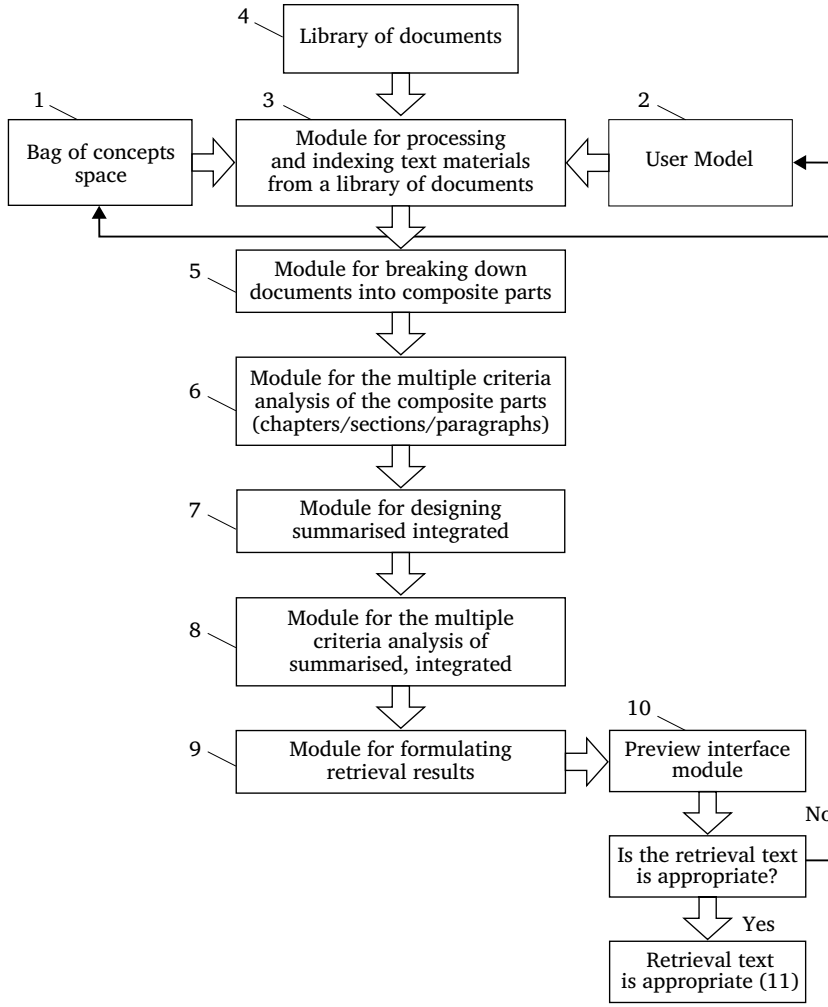


Figure 6.3. Concept-based Information Retrieval Model and System

The designing of alternative variants from the selected text materials contained in a library of documents covers the following stages: a) development of a table of codes of text materials from a library of documents, b) rejection of inefficient versions, c) computer-aided development of summarised, integrated text alternatives based on the codes compiled during Stage a), d) development of summarised, integrated text alternatives and the conceptual and quantitative

information describing them and e) development of a summary decision-making table of all the obtained summarised, integrated text alternatives and relavent conceptual and quantitative information overall.

A brief analysis of several major parts of the Model and System follows, as an example:

– Initial requirements for a search;
– User Model: Search for initial requirements, refining the search requirements and the Agent subsystem;
– Rational text selection: Module for the multiple criteria analysis of the composite parts (chapters/sections/paragraphs).

Initial requirements for a search

At the beginning of a search, a user is able to submit the following kinds of search requirements:

– The user indicates the goal or goals for the search – research, practical or cognitive. The user notes the possibilities of interest to him/her while conducting the search: research literature (books, academic articles and the like), practical literature or popular literature.

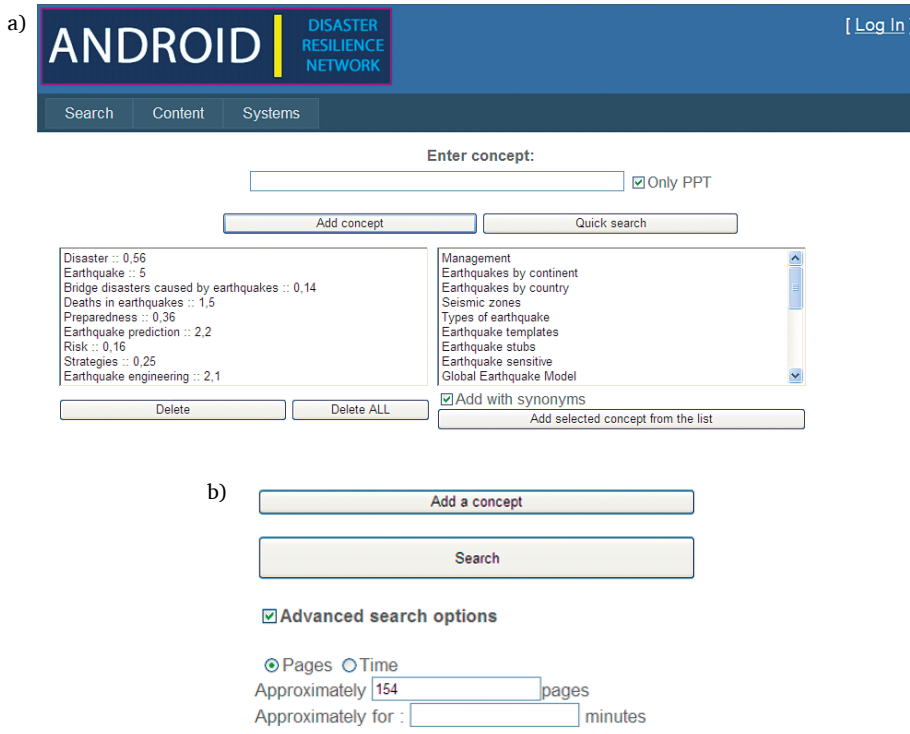


Figure 6.4. User window of the Electronic Information Retrieval System for the Android Project: a – Fragment of the User window; b – Advanced search options

– The user requests or selects bag of concepts space (see Figure 6.4).
– The user establishes various limitations (volume of the material under search by pages, desired time for reading a lecture by minutes and the like).

To limit the amount of search results showing the pages that include the concepts in question (or to restrict the search by the duration of reading), tick the option Advanced search options below the button Search. Additional fields appear: Aproximately... pages and Approximately for:.. minutes. You will also see round buttons to choose search either by the number of pages (default) or by the duration of reading (see Figure 6.4b).

User model: initial search requirements, refining the search requirements and the agent subsystem

The Agent subsystem accumulates information about a user and stores his/her individual data. This information can be explicit (year of birth or university graduation) or implicit. The main skills of a user are implicit. They consist of informal and unregistered knowledge, practical experiences and skills. Such data are very important because they describe a user's experience. Information about a user's existing education, needs and the like accumulate in the Agent subsystem.

As a user's historical search information is being analyzed, his/her initial search requirements can be refined (or made more specific). In this case, the user's behavior is under analysis; for example, which documents the user does or does not select for review, how often a document is viewed and how much time is spent looking at it along with use of the drag function are all under observation. This may partially be called the analysis of user conducted searches, the agent function. The Agent subsystem accumulates statistical information about the previous searches conducted by a user in a matrix form:

– Bag of concepts space of a search;
– Results of a search;
– How many times a user modified the initial search before suitable results were gained;
– The most popular resources and Internet website addresses employed by the user;
– How many times did a user read the selected material and how much time was spent doing so.

This way the automatic search is actually personalized by applying the historical information gathered by the Agent subsystem:

– Bag of concepts space under search is refined (or made more specific);
– Information about the user's education, work experience and search needs are considered;
– The user's most frequently employed resources, Internet website addresses and authors are considered;

– The user's opinion regarding the significance of the documents gained by the results of a search are considered.

Rational text selection: module for the multiple criteria analysis of the composite parts (chapters/sections/paragraphs)

The following factors determine a rational text:

– Popularity of a text (citation index, number of readers, time spent reading);
– Reputation of the documents;
– Supporting phrases;
– Document name and contents;
– Density of keywords.

These factors are briefly discussed below.

Popularity of a text

The citation index, number of readers and time spent reading determine the popularity of a text. Citations in full-text articles, books and bibliographical information contained in databases serve as a very useful foundation for indexing potentially useful text interrelationships. Nearly everyone writing a course report, not even to mention serious researchers, look for citations in documents applicable to the research undertaken in order to discover other documents of interest. Essentially each directive for a citation leads to an older document by means of a citation in a newer document thereby generating a sequential accumulation of material. Today the Science Citation Index (SCI), Social Sciences Citation Index (SSCI), Arts and Humanities Citation Index (AHCI) and others become standard tools allowing the tracking of a citation from an existing document to other documents that appear later.

There can be a considerable number of internal or external Internet website addresses used within a text that are interrelated with a specific term to be searched. This is one of the most important factors for establishing the importance priority of a text, using popularity for an objective assessment of an electronic document. Popularity is essentially equal to "votes" cast by other research works and/or websites, which substantiate the significance and popularity of your electronic document by providing links to it. For example, one of the reasons why Wikipedia is so popular in the world in numerous areas is its extremely effective system of internal and external links of this nature.

The Google Scholar (http://scholar.google.lt/), for one, can be used to establish a citation index.

The number of visiting readers and the length of time a document is read are also important descriptions about the popularity of a text.

Reputation of the documents

One of the goals for establishing the reputation of a document is to "measure" the usefulness and conditional importance of a text for researchers, practitioners

and the society-at-large. For instance, a user at work may be constantly searching for information about documents on the regulations of a built environment in Lithuania. The System provides information from a document entitled Lietuvos būsto strategijos [Housing Strategy of Lithuania]. This information had satisfied the user; thus, as the System conducts its usual search on this, it gives Lietuvos būsto strategijos and other documents relevant to it greater priority than it does to other documents. Furthermore it is of utmost importance to assess how many people viewed the document under discussion how many times and how much time they spent doing so.

Supporting phrases

"Supporting phrases" are also employed for the analysis of a text, which include synonyms and other words or phrases assisting a rational selection of a text required by the user.

Document name and contents

The name and contents of a document provide a concise description of the text under discussion. Thus the applicability of words contained in a document's name or table of contents to the keywords (their synonyms) of a search show that the document is relevant. The greater priority (significance) is ascribed to such documents.

Density of keywords

When keywords comprise five percent of a text, it means that five percent of all the words on a single page are the provided keywords. One to three percent keywords is an optimal proportion. The proportion of a text comprised of keywords is calculated by the formula $(N_{krž} / T_{vž}) * 100$, where $N_{kžr}$ denotes the number of times a specific keyword repeats, and $T_{vž}$ – the total number of words in the text under analysis. Thereby the value of the proportion of keywords in a text is calculated. To calculate the proportion of a text comprised of keyword phrases, the formula used is $(N_{kžr} * N_f / T_{vž}) * 100$, where N_f means the number of words in a phrase. In other words, as an example, when an applicable phrase is used four times within a text, and a page consists of four hundred words, the proportion of the page consisting of a keyword phrase is equal to (4*3/400)*100, or three percent.

Feedback on the appropriateness of the found document

It is intriguing to consider the different goals people have for their searches. At the same time, the search process itself guides the data discovery in terms of the reaction of the searcher to the delivered results, sometimes influencing the next iterations of the search query until the content that was sought after is sufficiently "found" (Loshin 2013).

A user could be dissatisfied with the results of an initial search and desire an additional search. There can be several reasons for this. For example, it could

happen that, at the time of the initial search, no documents are found that correspond to a minimal density of keywords in accordance with the search bag of concepts space the user has provided. In such a case, a modified search is undertaken to upgrade the search (i.e., by supplementing the search bag of concepts space).

The goal during the time of the search for information is a text selected for maximal satisfaction of the user's needs. At times researchers attempt to select out appropriateness, usefulness, interrelationship and other, similar concepts by appropriate types such as by appropriate topics or by the appropriateness for the user (it is claimed that a document can have an appropriate topic, thus being suitable, but a user cannot or does not want to use it: perhaps the language is incomprehensible, the user already has such a document, the document is too complicated or the like).

Feedback regarding the appropriateness of a found document relates with methods like modifying a search inquiry in accordance with the user's assessment of the appropriateness of the preliminarily found document. Generally an initial search is conducted according to the bag of concepts space that a user provides. The results of such an initial search are provided to the user along with an assessment questionnaire, wherein preliminary assessments of the appropriateness of the found documents to the needs of the user are provided. Then the initial search parameters are modified by employing the user's answers (for example, providing greater weight to the successfully used terms and lessening or eliminating the weights of less appropriate terms). Thereby a second search is conducted. Such an interaction may continue as long as a user wants it to.

The essence of the feedback on the appropriateness of a found document is taking the initial results according to the submitted questionnaire and formulating a new questionnaire in light of the appropriateness of the results.

The feedback function employed by this Method is the electronic intelligent analysis function.

Once the questionnaire parameters are filled out (the feedback regarding the appropriateness of the found document), other, more suitable documents are found during a search, which had been surpassed during the initial search; thusly overall effectiveness betters. Naturally the effect of such feedback very much depends on the quality of the terms selected to supplement the search and their weights. Besides, if the words submitted with the initial questionnaire are not related to the topic of the query or the weights attached to them are inappropriate, the quality of the search can prove poorer. Nonetheless the opposite is true also.

The results may give a user new ideas and thoughts for improving this search. The user then submits such information (desired authors, literature and Internet resources; bag of concepts space) for a repeat search.

The user can also indicate the appropriateness of the selected text directly by using a point system ranking usefulness. Usefulness is assessed on a some sort of a 10-point scale (for example, where zero points means “inappropriate”, four points means “somewhat appropriate, six points – “appropriate” or ten points “very appropriate”. Information about the reaction regarding appropriateness needs to be included in the initial questionnaire for the search to operate more effectively.

6.6.2.4. Concept-based information retrieval system for the Android project

The Concept-based Information Retrieval System for the Android project (http://iti.vgtu.lt/android/) that is designated to select text materials from a library of documents covering the bag of concepts space is connected to the Module for processing and indexing text material from a library of documents. This Module, containing connections with the text materials from a library of documents, is designated to select out and index text materials in accordance with the assigned bag of concepts space and the User Model and then to transmit the selected information to the Module for formulating retrieval results that is linked to the preview interface. Furthermore this System is designated to foresee the selecting out of the most suitable composite parts (chapters/sections/paragraphs) for the user from the Module for breaking down documents into composite parts, the Module for the multi-criteria analysis of the composite parts, the Module for designing the summarised, integrated text alternatives and the Module for the multiple criteria analysis of summarised, integrated text alternatives. It is also designated to assign the information received from the Module for processing and indexing text materials from a library of documents to be appropriately, consecutively processed and to transmit this to the Module for formulating retrieval results (see Figure 6.3).

The Concept-based Information Retrieval System for the Android project provides an opportunity to receive the information that is most appropriate for a specific user (such as text materials, graphics, tables, illustrations and so forth) in a specific size (from text materials of one paragraph to an unlimited size). Furthermore, in accordance with user wants, it is possible to receive material of a simpler or more complicated content. For example, the System can compile a simpler elective module for a user and a more complicated one for a scholar.

The Concept-based Information Retrieval System for the Android project that is designated to select out rational text material from a library of documents covers the following sequence of operations. A user assigns retrieval conditions specifically by inputting retrieval bag of concepts space. Once all the retrieval conditions have been inputted, this System by using User Model selects out rational text materials from a library of documents and performs its indexing

in accordance to the input bag of concepts space. Once the selecting out and indexing of the documents under analysis have been completed, the Concept-based Information Retrieval System for the Android project distinguishes documents composite parts, i.e., the paragraph, section, chapter and other parts and performs a multi-criteria analysis of these composite parts that covers the referencing of the weights of criteria in consideration of their quantitative and qualitative characteristics. The Concept-based Information Retrieval System for the Android project then performs the multi-criteria analysis of the text material alternatives and determines their utility degrees and market value. Utility degree score represents text rationality and value for each piece of text to the requested search concept. Result items are sorted and ranked by relevance. Once the multi-criteria analysis of the composite parts has been performed, the System designs alternative variants comprising the sum of the received, integrated information from the text materials. The design of alternative variants involves the following stages: a) compiling tables of alternative codes of the text, b) rejecting irrational variants, c) automatically compiling text variants in accordance to the alternative codes compiled in Point a), d) development the text variants and their descriptive information and e) development a decision-making table of the sum of the compiled text variants and their descriptive information. Following this, the System performs a multi-criteria analysis of the designed variants. This analysis is the basis for the System to determine the most rational alternative variants, formulate the retrieval results and show them to the user.

The Concept-based Information Retrieval System for the Android project that is designated to select out text materials from a library of documents covers the inputting of retrieval bag of concepts space (1) and the User Model (2), both of which are linked with the Module for processing and indexing text materials from a library of documents (3) that contains a link to a library of documents (4), where the information processing takes place. It also includes the Module for processing and indexing text materials from a library of documents (3), which selects and indexes the documents in accordance with the assigned bag of concepts space (1) and the User Model (2). The information about the selected documents is transmitted from the Module for processing and indexing text materials from a library of documents (3) into Module (5) for breaking down documents into composite parts (chapters/sections/paragraphs). The selected paragraphs/sections/chapters from the documents under analysis in Module (5) are further analysed, as per a multi-criteria analysis, in Module (6). From there the information lands into Module (7) for designing variants that is designated to compile alternative variants automatically from the sum of the integrated text materials. The alternative variants compiled from the rational text materials from a library of documents are analysed, as per a multi-criteria analysis, in Module (8). The most rational, alternative variants are established and these are

transmitted into Module (9) for formulating the retrieval, which shows the user the selected number of alternative variants (see Figure 6.3).

The retrieval alternatives are determined (9 and 10, Figure 6.3). If the retrieval text is appropriate, the search process is finished (11, Figure 6.3) and result items are quickly located and displayed. If retrieval text is not enough appropriate the retrieval approximation cycle should be repeated. In this case, the refined User Model (2) and advanced Bag of concepts space (1) are substituted into a Module for processing and indexing text materials from a library of documents (3) and the retrieval process should be repeated until the retrieval text will be appropriate.

Examples for executing the different retrieval stages are presented next in greater detail (see Figure 6.3).

All the required text materials are placed into a library of documents (4). The user inputs the most important bag of concepts space for him/her through interface (1). Bag of concepts space can also be selected from the retrieval's concepts database, where the most frequently used concepts are stored. A ten-point scale is applied to assess the level of complexity of the material under search. For example, mathematically orientated sections in text material (mathematical methods and the determinations of used market and investment values) are quite complicated for certain users. The determination of the most rational material under search along with its level of complexity and its significance permit an assessment in complex with the other system of criteria. The indexation of the information is performed in Module (3) while a text is being indexed; i.e., the number of times the searched words (their synonyms) or their combinations are repeated in the text is determined.

As the text indexing is being performed, an effort is made to determine the degree to which its chapters/subchapters/paragraphs satisfy the retrieval needs of the user. A greater number of concepts in a text of a specific size indicates a greater level of satisfying user needs. The weight of a keyword indicates how much more important one keyword is to the user than some other one is, while searching for specific informational material. The repetition of different retrieval keywords in one sentence also defines the suitability of the text for satisfying the user's needs. Several different retrieval keywords that a user wants in the same sentence indicate a greater suitability of the text for the user's needs.

Thereby, once having indexed the selected information in Module (3), rational chapters/sections/paragraphs in the different text materials from a library of documents is determined in Module (5).

The multivariant design and multi-criteria analysis of the composite parts of selected text materials is performed in Module (6). This covers the following methods developed by authors (Kaklauskas 1999):

– Method for a complex determination of the weights of the criteria taking into account their quantitative and qualitative characteristics.
– Multiple Criteria Method for a Complex, Proportional Evaluation of Text Materials.
– Method for a multi-criteria, multivariant design of summarised, integrated text variants
– Method for a determination of the utility degree and market value of the text materials.

A brief analysis of the above Multiple Criteria Method for a Complex, Proportional Evaluation of Text Materials and Method for defining the utility degree and market value of text material alternatives follows, as an example.

6.6.3. Efficiency increase of export on-line systems by applying multiple criteria decision support systems

6.6.3.1. e-Commerce and on-line decision support systems

Theoretical and practical aspects of decision support systems in electronic commerce were dealt with in various research papers by D. G. Conway *et al.* (2000), R. Debreceny *et al.* (2002), F. Ramos *et al.* (2002), R. Kohlu *et al.* (2001), and others.

N. Wickramasinghe and G. L. Mills (2002) demonstrated the importance of integrating a knowledge management focus in many e-commerce initiatives and concluded by outlining the implications of such a focus for all organizations that try to increase their customer's moment of value.

J. Contreras and A. J. Conejo (2002) presents the project OMEGA by developing a decision support system for electricity producers to support energy management and energy trading groups within these companies in their commercial activities on open and competitive electricity markets by using an e-commerce framework.

E. W. T. Ngai *et al.* (2002) present a literature review and classification (application areas, technological issues, support and implementation, etc.) scheme for electronic commerce research.

N. Karacapilidis *et al.* (2001) describes a web-based electronic commerce system in which customers and merchants delegate the related tasks to their personal software agents. According to N. Karacapilidis *et al.* (2001), advanced features of the system include the permanent existence of agents in the market, thus being able to learn from it, their ability to act proactively in order to initiate a transaction, and the integration of an interactive multiple criteria decision-making tool, with which a buying agent performs a comparative evaluation of the proposals in a semi-autonomous way.

G. L. Lilien *et al.* (2001) described decision-making models for the digital, networked economy.

Theoretical and practical aspects of Web-based decision support systems were analyzed by various researchers such as, B. G. Silverman *et al.* (2001), G. E. Kersten *et al.* (1999), H. Ping Tserng I. (2002), etc.

B. G. Silverman *et al.* (2001) stated that the appropriate decision support and search technology cannot be fully bought off-the-shelf and significant investment and effort is required at any given website in order to create the decision support and search agents that are needed to properly support buyer's decision-making.

H. Ping Tserng *et al.* (2002) have developed a web-based decision support system for general contractors.

S. Nasirin and D. F. Birks (2002) described DSS implementation in the UK's retail organizations. Three major retailers who have already developed and utilized their GIS to varying degrees are used in the case study.

An analysis of e-commerce and on-line decision support systems that were developed by researchers from various countries assisted the authors to create one of their own Multiple Criteria On-Line Export Decision Support System (EDSS). EDSS differs from others in its use of new multiple criteria analysis methods as were developed by the authors.

6.6.3.2. Web-based systems for export

International trade is an information business. Technological innovations mainly through changes in the availability of information and communication technology combined with calculators, analyzers, software, decision support, expert and e-commerce systems have been provided by a variety of new services that have been developed from the international trade sector.

International trade Web sites contains a variety of e-commerce systems (BizownerHQ.com, Open Harbor, TRADEPAQ Corporation, ValiCert Inc). By way of illustration, we provide a short description of TRADEPAQ system. TRADEPAQ's suite of applications offers end-to-end Internet Trade Logistics (iTL) functionality that enables enterprises to access real-time information, manage the complex shipping requirements of electronic commerce, generate multi-lingual trade documents, and maintain compliance with international trade regulations. In addition, TRADEPAQ also offers solutions that support requirements of global e-commerce banking such as letter of credit creation, receipt, management, and collection.

Various purposes export software can be used by the on-line regime:

- Sn@p (Expeditors International of Washington Inc). Web based tool to enable Expeditor's customers to electronically book, arrange for pick up, and track shipments with Expeditors, as well as, produce export documentation regardless of the forwarder or carrier.

- MyCustoms software (Open Harbor) calculates the Total Landed Cost, including duties, VAT and all other relevant customs charges in real time. Also provides real-time confirmation of import/export compliance with all government regulations and requirements, processes customs documents and collects and provides for all payments to customs departments.
- The MetalOrigins system (Metal Origins L.L.C) provides an internet tool for alloys businesses to manage contracts, release products, track deliveries, and create invoices in real-time.

Calculators range from very cheap software and are capable of performing calculations from basic arithmetic operations to those whose capabilities extend to sophisticated mathematical and statistical manipulation and those that may be programmed with large numbers of steps. Web sites with various purposes for International Trade contains a variety of calculators: Complete Export Pricing Calculator (World Federation of Trading House Associations), Import Calculator (Bank one corporation), Exposure Fee Calculator (Export Development Canada), Interest/Loan Payment Calculator (Foreign Trade On-Line), etc.

Web sites might also contain various purpose analyzers (TRADEPAQ Corporation, ValiCert Inc., JoC global transport analyser) which help customers to analyze various situations.

Various expert systems (Expert System for the Application of Import and Export Regulations, Trading Expert System, Business Valuation (BizownerHQ.com), Business Consultant (Business technology network), etc.) can be found on Web sites.

The major players in international trade Web sites can find various purpose decision support systems. That is, Export Analysis Tools and Decision Support System, Logistics Solution (export, dispatch, freight and import), Alternative Resource Base for Forest-Based Export Industries, Wine Producers Who Wish to Export their Products Overseas, State of the Art Decision Support System (GarmentSoft) (Nusbaum 2001), etc.

Above Web-based Systems for Export are seeking to find out how to make the most economic decisions, and most of all these decisions are intended only for economic objectives. Alternatives under evaluation have to be evaluated not only from the economic position, but take into consideration qualitative, technical, risk and other characteristics as well. Alternative solutions allow for a more rational and realistic assessment of economic, technical, qualitative conditions and traditions and for more satisfaction of different customer requirements. Therefore, applying multiple criteria decision support systems may increase the efficiency of e-business.

6.6.3.3. Models of export efficiency analysis

The models of gravity, econometrics, portfolio theory and multiple criteria analysis, etc. are used for the analysis of export and the forecast of its development

trends. Depending on the subject and goals of the research, as well as the amount and objectivity of the available data, it is believed to be reasonable to use different models of export analysis.

Most of the world's countries use gravity models and export/import functions for the analysis and forecast of international trade. These models have been prepared by various institutions and therefore differ in terms of the level of their detailed descriptions and finish. That is, i.e. some of them offer a general description of export/import dimensions, whereas the others discriminate major groups of commodities and even give their detailed classification. The majority of export/import functions, beside other export/import determinants, analyze the influence of the average prices of products exported and imported by certain countries (in comparison with the world market prices) and influences on the dynamics of flow of products among other countries.

Export/import functions, in terms of the forms of their manifestation and the composition of determinants of various groups of products that efficiently influence export/import, are manifold. Econometrical analysis shows that the best equation selection method is empirical, i.e. on assessing the parameters of various equations, their further adequacy is checked by means of standard methods of an econometrical analysis. Therefore, various groups of products should be offered as a wider specter of the export/import functions as is possible. They could be checked experimentally and then the best of them should be selected.

Gravity equations have widely been used in empirical studies addressing the issues in international trade (O. Havrylyshin *et al.* (1991), M. Sanso I. (1993), etc.). Four categories of gravity equations applications are most well-known: estimating the cost of the border, explaining trade patterns, identifying the effects related to regionalism and the calculation of trade potentials. The calculation of trade potentials has in particular been used widely for Central and Eastern European Countries (Wang *et al.* 1991), O. Havrylyshyn (1991), R. Baldwin (1993), D. Schumacher (1997)). E. Leamer (2000), A. Harisson I. (1999), and M. Slaughter (1998) analysed the relationship between trade and employment.

The models of gravity, econometrics, portfolio theory and multiple criteria analysis, etc. have both positive and negative features. For example, the models of gravity and econometrics have the following drawbacks:

- The above two models give an export analysis in a too simplified way. As we all know, export competitiveness is predetermined by many different factors, whereas these models exclude many indices from their calculations.
- The possibilities of the application of these models are reduced along with the qualitative changes in the international trade relations. For example, it is rather difficult to apply them in countries with a transitional economy, such as in Lithuania. These qualitative changes considerably modify the trajectory of the projected indices, whereas the changes themselves are rarely accurately describable due to the lack of information.

The modelling of Lithuanian export could be carried out (for certain remuneration) by various organizations, e.g. World Bank, UNCTAD, WTO, etc. While modelling exports of various countries the above-mentioned institutions apply gravity and econometrical models. However, they cause some additional problems. For example, only the final results of export modelling, with certain explanatory notes, are provided in the closing section of the analysis. As a rule, the physical implications remain obscure and insufficient, which worsens the reliability of the results. With the aim of avoiding the aforementioned drawbacks, we recommend using the methods of export analysis and EDSS as were developed by the authors of the paper by offering the following practical solutions:

- Analysis of the competitiveness of export sectors;
- Analysis of the competitiveness of Lithuanian export products;
- Analysis of the prospective markets.

The worldwide largest trade database COMTRADE (the United Nations Statistical Division) is used for carrying out the above-mentioned analyses. The Database collects information on 184 countries and 3,500 products, which covers approximately 90% of the world trade.

The physical implications of the recommended methods for export analysis and EDSS are in this way absolutely clear. This would provide a basis for carrying out a Lithuanian export analysis by using different profiles on a regular basis.

6.6.3.4. Multiple criteria on-line export decision support system developed by the authors

Database and model base of multiple criteria on-line export decision support system

Multiple Criteria On-Line Export Decision Support System (EDSS) comprises of the following three constituent parts: data (database and its management system), models (model base and its management system) and a user interface.

According to the user's needs, various models of EDSS may be provided by a model management system. When a certain model (i.e. determination of criteria weights) is used, the results obtained become the initial data for some other models (i.e. a model for multiple criteria analysis and for the setting priorities). The results of the latter, in turn, may be taken as the initial data for some other models (i.e. analysis of the competitiveness of export sectors, analysis of the competitiveness of exported products and an analysis of prospective markets).

EDSS stores and processes information and data from various sources. By using different MCDM models it provides the decision-maker with information necessary for analysing, compiling and evaluating the possible decision alternatives, making decisions and effecting the output and storage of the obtained results. The developed EDSS enables consumers to transform unprocessed data into information necessary for the analysis of a particular problem and to be used for further decision-making.

EDSS provides a framework through which decision-makers can obtain the necessary assistance for a decision through an easy-to-use menu system. Generally, an EDSS provides help in formulating alternatives, accessing data, developing models and interpreting their results, selecting options or analysing the impacts of the selection made.

The following multiple criteria analysis methods and models as developed by the authors (1998) are used by the EDSS in the analysis of the competitiveness of export sectors, exported products and prospective markets:

- A new method and model of complex determination of the weight of the criteria taking into account their quantitative and qualitative characteristics was developed. This method allows to calculate and coordinate the weights of the quantitative and qualitative criteria according to the above characteristics.
- A new method and model of multiple criteria complex proportional evaluation of the projects enabling the user to obtain a reduced criterion determining complex (overall) efficiency of the project was suggested. This generalized criterion is directly proportional to the relative effect of the values and weights of the criteria considered on the efficiency of the project.

In order to find what price will make an object being valuated competitive on the market a method and model of determining the utility degree and market value of projects based on the complex analysis of all their benefits and drawbacks was suggested. According to this method the objects utility degree and the market value of an project being estimated are directly proportional to the system of the criteria adequately describing them and the values and weights of these criteria.

A new method and model of multiple criteria multivariant design of a project life cycle enabling the user to make computer-aided design of up to 100,000 alternative project versions was developed. Any project life cycle variant obtained in this way is based on quantitative and conceptual information.

While analysing export, the main issue that should be solved in this regard, is the determination of the system of criteria, giving a detailed definition of the export. The determination of the system of criteria is aggravated by the requirement that the system should represent not only the current period but also the long-term development prospects of the state's economy. Various criteria are universally used for the purpose of substantiating the long-term export development trends and for selecting alternative products and geographical structures, therefore enabling the assessment of the efficiency of products (groups of products) and export.

The formation of systems of criteria describing sectors, products and markets was based on thoughts of different authors. This is because the goals of interested groups and systems of criteria describing sectors, products and markets by

some means are relatively subjective. Therefore, in order to increase the level of objectivity of this analysis, the formation of systems of criteria describing sectors, products and markets was based on ideas of professionals and different literature from within the field.

Systems of criteria exhaustively reflect the sectors analyzed products and markets at this moment in time and the prospects of their development. When determining values and weights of criteria, the positive and negative characteristics of the analyzed sectors, the products and markets must be taken into account. The system of qualitative criteria, their values and weights are determined by using interviews, questionnaires and expert methods.

A short description of the EDSS (http://193.219.145.94/) in the analysis of sectors, products and markets follows.

Analysis of the competitiveness of export sectors of a country under consideration by the EDSS

Analysis of the competitiveness of export sectors of a country under consideration is carried out in a complex way by using comparisons with other countries, at this moment in time and according to changes in performance. The effectiveness of export sectors can be determined by using the following systems of criteria: the volume of exports, value of export per capita, share of the world market and changes of shares in the world market. Further, by the diversification of products, changes of diversification of products, diversification of markets and changes of diversification of markets and import and export ratios.

On the basis of the COMTRADE database (of the United Nations Statistics Division), a database of international competitiveness analysis of export sectors of 7 countries (Denmark, Finland, France, Germany, Lithuania, Portugal, UK) was formed.

The results of the comparative analysis of export sectors are presented as a grouped decision making matrix where columns contain n export sectors of a country under consideration, while all quantitative information pertaining to them is found in Table 6.1.

In order to perform a complete study of the export sectors a complex evaluation of its economic, technical, qualitative, technological, social, legislative, infrastructure and other aspects is needed. Quantitative and conceptual descriptions provide this information.

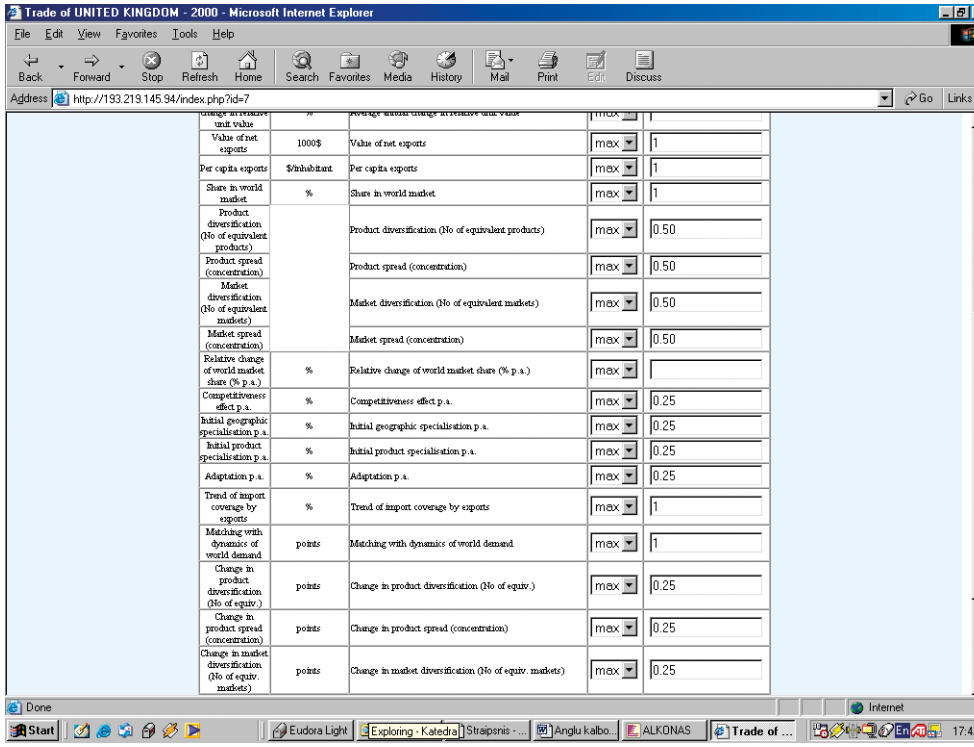
The diversity of aspects being assessed should include a variety of presented data needed for decision-making. Therefore, the necessary conceptual information may be presented in numerical, textual, graphical (schemes, graphs, diagrams, drawings), equation formats, audio or as a video. The criteria used for conceptual descriptions, their definitions and reasons for choice of the criteria's system, their values and weights (see Table 6.2) should all be analysed.

Table 6.1. International competitiveness analysis of the export sectors of a country under consideration

Quantitative information								
Criteria describing the exact export sector	*	Weights	Measuring units	Export sectors of a country under consideration				
				Agriculture	Textile	...	Timber	Cnstruction
Volume of exports	S_1	Q_1	m_1	x_{11}	x_{12}	...	x_{1j}	x_{1n}
Share of the world's market	S_2	Q_2	m_2	x_{21}	x_{22}	...	x_{2j}	x_{2n}
...	...	...	...	...	...	...	...	...
Diversification of products	S_i	q_i	m_i	x_{i1}	x_{i2}	...	x_{ij}	x_{in}
...	...	...	...	...	...	...	...	...
Diversification of markets	S_t	q_t	m_t	x_{t1}	x_{t2}	...	x_{tj}	x_{tn}
Conceptual information								
K_k	$K_ž$	K_q	K_m	K_1	K_2	...	K_j	K_n
After a multiple criteria analysis of the sectors, the following will be determined:								
Priority of the sector				P_1	P_2	...	P_j	P_d
Tendencies, i.e. what the percentage of increase (or decrease) of the position (i.e. comparative advantages) of the export sectors of a country under consideration with similar sectors in other countries, during the period analysed.				E_1	E_2	...	E_j	E_d

* The sign S_i (+/-) indicates that a greater/lesser criterion value corresponds to a greater significance for an exporter

Table 6.2. Fragment of the weights of the criteria of the UK's export sectors



Value of net exports	1000$	Value of net exports	max	1
Per capita exports	$/inhabitant	Per capita exports	max	1
Share in world market	%	Share in world market	max	1
Product diversification (No of equivalent products)		Product diversification (No of equivalent products)	max	0.50
Product spread (concentration)		Product spread (concentration)	max	0.50
Market diversification (No of equivalent markets)		Market diversification (No of equivalent markets)	max	0.50
Market spread (concentration)		Market spread (concentration)	max	0.50
Relative change of world market share (% p.a.)	%	Relative change of world market share (% p.a.)	max	
Competitiveness effect p.a.	%	Competitiveness effect p.a.	max	0.25
Initial geographic specialisation p.a.	%	Initial geographic specialisation p.a.	max	0.25
Initial product specialisation p.a.	%	Initial product specialisation p.a.	max	0.25
Adaptation p.a.	%	Adaptation p.a.	max	0.25
Trend of import coverage by exports	%	Trend of import coverage by exports	max	1
Matching with dynamics of world demand	points	Matching with dynamics of world demand	max	1
Change in product diversification (No of equiv.)	points	Change in product diversification (No of equiv.)	max	0.25
Change in product spread (concentration)	points	Change in product spread (concentration)	max	0.25
Change in market diversification (No of equiv. markets)	points	Change in market diversification (No of equiv. markets)	max	0.25

Legend: 1st column – title of criteria, 2nd column – measuring units of criteria, 3rd column – description of criteria, 4th column – the sign max (min) indicates that a greater/lesser criterion value corresponding to a greater significance for a exporter, the weights of the criteria of the UK's export sectors.

During the analysis of the export sectors of a country under consideration, such a database has to be filled in.

After a multiple criteria analysis of the export sectors, the following will be determined:

- Priority of the sectors (for example, see Table 6.3). One can see which the sector is most competitive in the country under consideration both statically and dynamically.
- Tendencies, i.e. what the percentage of increase (or decrease) of the position (i.e. comparative advantages) of the export sectors of a country under consideration with similar sectors in other countries, during the period analysed.

The results of the multiple criteria analysis of the UK's export sectors carried out by the EDSS coincide with ITS calculations was based on COMTRADE of UNSD.

Table 6.3. Fragment of the results of multiple criteria analysis of the UK's export sectors

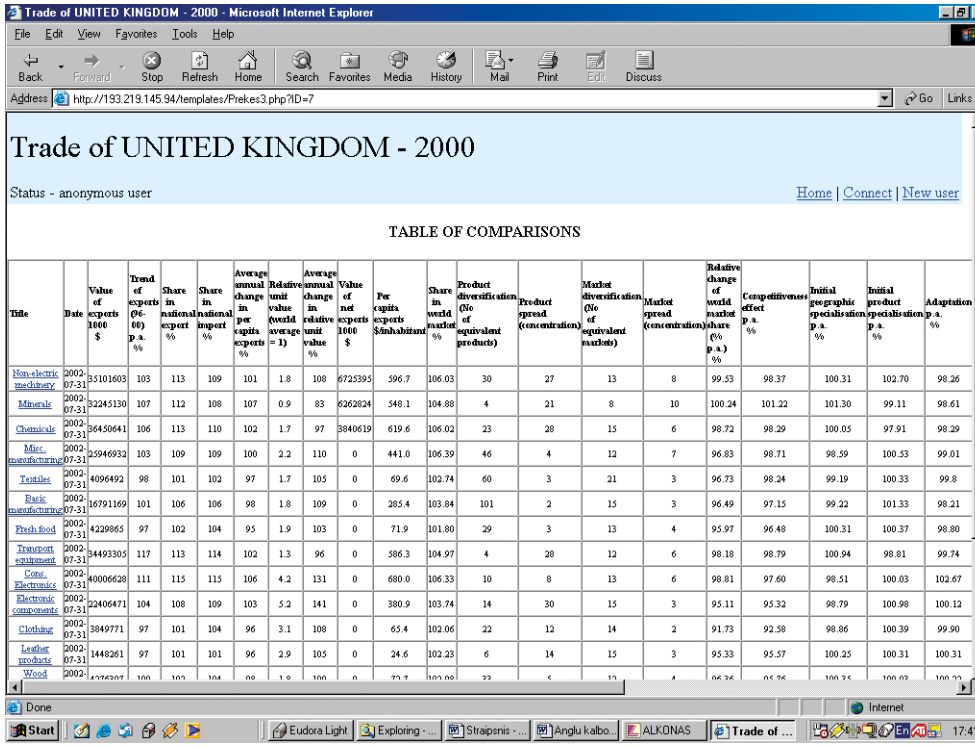


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TABLE OF COMPARISONS

Title	Date	Value of exports 1000 $	Trend of exports (96-00) p.a. %	Share in national export %	Share in national import %	Average annual change in per capita exports %	Relative unit value (world average = 1)	Average annual change in relative unit value %	Value of net exports 1000 $	Per capita exports $/inhabitant	Share in world market %	Product diversification (No of equivalent products)	Product spread (concentration)	Market diversification (No of equivalent markets)	Market spread (concentration)	Relative change of world market share (% p.a.) %	Competitiveness effect p.a. %	Initial geographic specialisation p.a. %	Initial product specialisation p.a. %	Adaptation p.a. %
Non-electric mechinery	2002-07-31	35101603	103	113	109	101	1.8	108	6725395	596.7	106.03	30	27	13	8	99.53	98.37	100.31	102.70	98.26
Minerals	2002-07-31	32245130	107	112	108	107	0.9	83	6262824	548.1	104.88	4	21	8	10	100.24	101.22	101.30	99.11	98.61
Chemicals	2002-07-31	36450641	106	113	110	102	1.7	97	3840619	619.6	106.02	23	28	15	6	98.72	98.29	100.05	97.91	98.29
Misc. manufacturing	2002-07-31	25946932	103	109	109	100	2.2	110	0	441.0	106.39	46	4	12	7	96.83	98.71	98.59	100.53	99.01
Textiles	2002-07-31	4096492	98	101	102	97	1.7	105	0	69.6	102.74	60	3	21	3	96.73	98.24	99.19	100.33	99.8
Basic manufacturing	2002-07-31	16791169	101	106	106	98	1.8	109	0	285.4	103.84	101	2	15	3	96.49	97.15	99.22	101.33	98.21
Fresh food	2002-07-31	4229865	97	102	104	95	1.9	103	0	71.9	101.80	29	3	13	4	95.97	96.48	100.31	100.37	98.80
Transport equipment	2002-07-31	84493305	117	113	114	102	1.3	96	0	586.3	104.97	4	28	12	6	98.18	98.79	100.94	98.81	99.74
Cons. Electronics	2002-07-31	40006628	111	115	115	106	4.2	131	0	680.0	106.33	10	8	13	6	98.81	97.60	98.51	100.03	102.67
Electronic components	2002-07-31	22406471	104	108	109	103	5.2	141	0	380.9	103.74	14	30	15	3	95.11	95.32	98.79	100.98	100.12
Clothing	2002-07-31	3849771	97	101	104	96	3.1	108	0	65.4	102.06	22	12	14	2	91.73	92.58	98.86	100.39	99.90
Leather products	2002-07-31	1448261	97	101	101	96	2.9	105	0	24.6	102.23	6	14	15	3	95.33	95.57	100.25	100.31	100.31
Wood	2002-																			

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Analysis of the Competitiveness of Exported Products by the EDSS

In order to determine the most effective exported products of a country under consideration, their competitiveness analysis was carried out, both statically and dynamically. The effectiveness of exported products can be determined by using the following system of criteria: volume of exports, the increase of exports, the stability of export increases during the analysed period and world market shares. Further, by analyses of the changes in world market shares, changes of world import markets, product quality and price ratio and number of import markets.

On the basis of the COMTRADE database, a database of the competitiveness analysis of exported products of 7 countries (Denmark, Finland, France, Germany, Lithuania, Portugal, UK) was formed see Table 6.4.

The results of the comparative analysis of exported products are presented as a grouped decision making matrix where columns contain n exported products of a country under consideration, while all quantitative information pertaining to them is found in Table 6.4.

Table 6.4. Analysis of the competitiveness of exported products of a country under consideration

Quantitative information								
Criteria describing exported products	*	Weights	Measuring units	Exported products				
				1	2		j	N
Volume of exports	S_1	q_1	m_1	x_{11}	x_{12}	...	x_{1j}	x_{1n}
Increase of exports	S_2	q_2	m_2	x_{21}	x_{22}	...	x_{2j}	x_{2n}
...	...	...	...	...	...	...	...	...
World market share	S_i	q_i	m_i	x_{i1}	x_{i2}	...	x_{ij}	x_{in}
...	...	...	...	...	...	...	...	...
Changes in world market share	S_t	q_t	m_t	x_{t1}	x_{t2}	...	x_{tj}	x_{tn}
Conceptual information								
K_k	$K_ž$	K_q	K_m	K_1	K_2	...	K_j	K_n
After completing a multiple criteria analysis of exported products, the following will be determined:								
Priority of products				P_1	P_2	...	P_j	P_d
Tendencies, i.e. what the percentage of increase (or decrease) of the position of an exact product compared to another during the period analyzed is				E_1	E_2	...	E_j	E_d

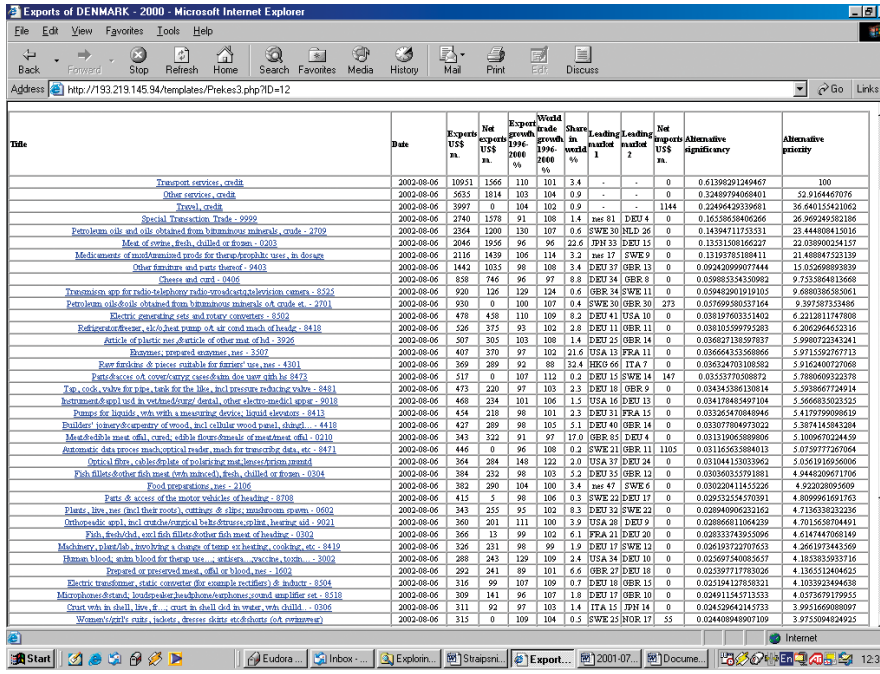
* The sign S_i (+/–) indicates that a greater/lesser criterion value corresponds to a greater significance for an exporter

After completing a multiple criteria analysis of exported products of a country under consideration, the following will be determined:

- Priority of products of a country under consideration (for example, see Table 6.5). One can easily see the reasons why one or another product is more competitive. The products taking the first places meet world requirements according to their competitiveness and of a country under consideration is well prepared for their export.
- Tendencies, i.e. what the percentage of increase (or decrease) of the position of an exact product compared to another during the period analysed.

The results of the multiple criteria analysis of the Danish export products carried out by the EDSS coincide with ITS calculations was based on COMTRADE of UNSD.

Table 6.5. Fragment of the results of multiple criteria analysis of the Danish export products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Title	Date	Exports US$ m.	Net exports US$ m.	Export growth 1996-2000 %	World trade growth 1996-2000 %	Share in world %	Leading market 1	Leading market 2	Net imports US$ m.	Alternative significancy	Alternative priority
Transport services, credit	2002-08-06	10951	1566	110	101	3.4	-	-	0	0.613989291249467	100
Other services, credit	2002-08-06	5635	1814	103	104	0.9	-	-	0	0.324897940694401	52.91644670076
Travel, credit	2002-08-06	0	0	104	102	0.9	-	-	1144	0.224964329339681	36.64015423911062
Special Transaction Trade - 9999	2002-08-06	2740	1578	91	108	1.4	nes 81	DEU 4	0	0.165586584062661	26.96924958286
Petroleum oils and oils obtained from bituminous materials, crude - 2709	2002-08-06	2364	1200	130	107	0.6	SWE 30	NLD 26	0	0.143947117535531	23.44480841501
Meat of swine, fresh, chilled or frozen - 0203	2002-08-06	2046	1956	96	96	22.6	JPN 33	DEU 15	0	0.135315081662276	22.03890025415
Medicaments of mixed/unmixed prods for therap/prophilc uses, in dosage	2002-08-06	2116	1439	106	114	3.2	nes 17	SWE 9	0	0.131937851884111	21.48884752313
Other furniture and parts thereof - 9403	2002-08-06	1442	1025	98	108	3.4	DEU 37	GBR 13	0	0.092420999077444	15.05269893839
Cheese and curd - 0406	2002-08-06	858	746	96	97	8.8	DEU 34	GBR 8	0	0.059885354350982	9.753586481366
Transmissn app for radio-telephony radio-broadcstg,television camera - 8525	2002-08-06	920	126	129	124	0.6	GBR 34	SWE 11	0	0.059482901919105	9.688038585061
Petroleum oils&oils obtained from bituminous minerals o/t crude et. - 2701	2002-08-06	930	0	100	107	0.4	SWE 30	GBR 30	273	0.057699380537164	9.39758735348
Electric generating sets and rotary converters - 8502	2002-08-06	478	438	110	109	8.2	DEU 41	USA 10	0	0.038197603351402	6.221281174780
Refrigerator/freezer, el/o/heat pump o/t air cond mach of headg - 8418	2002-08-06	526	375	93	102	2.8	DEU 11	GBR 11	0	0.038105599795283	6.206296465231
Article of plastic nes,&article of other mat of hd - 3926	2002-08-06	507	305	103	108	1.4	DEU 25	GBR 14	0	0.036827138597837	5.998072343241
Enzymes; prepared enzymes, nes - 3507	2002-08-06	407	370	97	102	21.6	USA 13	FRA 11	0	0.036664353568866	5.971559276771
Raw furskins & pieces suitable for furriers' use, nes - 4301	2002-08-06	369	289	92	88	32.4	HKG 66	ITA 7	0	0.036324703108582	5.916240072706
Parts&accsr o/t cover/canvy cves&arts dse user ith hr 8473	2002-08-06	517	0	107	112	0.2	DEU 15	SWE 14	147	0.035537705088072	5.788060932237
Tap, cock, valve for pipe, tank for the like, incl pressure reducing valve - 8481	2002-08-06	473	220	97	103	2.3	DEU 18	GBR 9	0	0.034343861308814	5.593866724914
Instrument&appl used in vet/med/surg/ dental, other electro-medicl appar - 9018	2002-08-06	468	234	101	106	1.5	USA 16	DEU 13	0	0.034178485497104	5.566835023525
Pumps for liquids, wth with a measuring device, liquid elevators - 8413	2002-08-06	454	218	98	101	2.3	DEU 31	FRA 15	0	0.033265470848946	5.417979098619
Builders' joinery&carpentry of wood, incl cellular wood panel, shingl... - 4418	2002-08-06	427	289	98	105	5.1	DEU 40	GBR 14	0	0.033077804973022	5.387145843284
Meat&edible meat offal, cured; edible flours&meals of meat&meat offal - 0210	2002-08-06	343	322	91	97	17.0	GBR 85	DEU 4	0	0.033139065889806	5.400967022445
Automatic data proces mach;optical reader, mach for transcribg data, etc - 8471	2002-08-06	446	0	96	108	0.2	SWE 21	GBR 11	1105	0.031165635884013	5.075977267064
Optical fibre, cables&plate of polarizing mat,lenses/prism,mounte	2002-08-06	364	284	148	122	2.0	USA 37	DEU 24	0	0.031044153033962	5.056191695006
Fish fillets&other fish meat (wth mince), fresh, chilled or frozen - 0304	2002-08-06	384	252	98	103	5.2	DEU 35	GBR 12	0	0.030360355791881	4.944820967170
Food preparations, nes - 2106	2002-08-06	382	280	104	100	3.4	nes 47	SWE 6	0	0.030220411455226	4.922028095609
Parts & access of the motor vehicles of heading - 8708	2002-08-06	415	5	98	106	0.3	SWE 22	DEU 17	0	0.029532554570391	4.809961691763
Plants, live, nes (incl their roots), cuttings & slips; mushroom spawn - 0602	2002-08-06	343	255	95	102	8.3	DEU 32	SWE 22	0	0.028940906232162	4.713633823236
Orthopedic appl, incl crutche/surgical belts&trusses,splint, hearing aid - 9021	2002-08-06	360	201	111	100	3.9	USA 28	DEU 9	0	0.028066811064239	4.570156870491
Fish, fresh/chd, excl fish fillets&other fish meat of heading - 0302	2002-08-06	366	13	99	102	6.1	FRA 21	DEU 20	0	0.028333743955096	4.614744706814
Machinery, plant/lab, involving a change of temp ex heating, cooking, etc - 8419	2002-08-06	326	231	98	99	1.9	DEU 17	SWE 12	0	0.026193722707653	4.266197443569
Human blood; anim blood for therap use ... antisera, ...vaccine,toxin... - 3002	2002-08-06	288	243	129	109	2.4	USA 34	DEU 10	0	0.025697540083657	4.185385933716
Prepared or preserved meat, offal or blood, nes - 1602	2002-08-06	292	241	89	101	6.6	GBR 27	DEU 18	0	0.025397717783026	4.136512404625
Electric transformer, static converter (for example rectifier) & inductr - 8504	2002-08-06	316	99	107	109	0.7	DEU 18	GBR 15	0	0.025194127858321	4.103392349638
Microphones&stand; loudspeaker,headphone/earphones;sound amplifier set - 8518	2002-08-06	309	141	96	107	1.8	DEU 17	GBR 10	0	0.024911545713533	4.057367179955
Crust wth in shell, live, fr ..., crust in shell ckd in water, wth chilld... - 0306	2002-08-06	311	92	97	103	1.4	ITA 15	JPN 14	0	0.024529642145733	3.995166908809
Women's/girl's suits, jackets, dresses skirts etc&shorts (o/t swimwear)	2002-08-06	315	0	109	104	0.5	SWE 25	NOR 17	55	0.024408948907109	3.975509482492

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For a better understanding of the analysis of Danish competitiveness of exported products by the EDSS, we made a comparison (see Table 6.5) of the 1st alternative (Meat from swine that was fresh, chilled or frozen; HS code: 0203) and the 2nd one (Petroleum oils and oils obtained from bituminous minerals, crude; HS code: 2709).

The net exports (US$ m.) in 2000 and the world share (%) in the 1st version is higher. The 2nd alternative, however, differs from the 1st one in possessing other better characteristics (i.e. exports (US$ m.) in 2000, export growth in 1996–2000 (%) and world trade growth in 1996–2000 (%)).

From Table 6.5 we see that each criterion unites with its measurement unit and weight. The magnitude of weight indicates how many times one criterion is more significant than other criterion. For example, in the evaluation of export growth from 1996–2000 by computer-aided calculations, it was found that qeg = 0.15, which is 1.5 (qeg: qne = 0.15 : 0.1 = 1.5) times more significant for exporter than the Net exports (qne = 0.1).

The results of a multiple criteria evaluation of Danish competitiveness of exported products are presented in Table 6.5. Table 6.5 shows that the 2nd alternative (Petroleum oils and oils obtained from bituminous minerals, crude; utility degree N2 = 23.44) is better than the 1st alternative (Meat from swine

that was fresh, chilled or frozen; N1 = 22.04), i.e. export of the 2nd alternative (Petroleum oils and oils obtained from bituminous minerals, crude) is 1.06 (N2 : N1 = 23.44 : 22.04 = 1.6) times more efficient than the export of the 1st alternative (Meat from swine that was fresh, chilled or frozen).

Analysis of Prospective Markets by the EDSS

Prospective markets can be evaluated by using the following system of criteria: volume of exports, increase of exports, stability of export increases during an analyzed period, export market shares in Lithuania and export market shares in the world. Also, changes in the world market share and changes in the world import market and product quality and price ratio and by the disposal towards Lithuanian products of current consumption traditions, price levels of the market, safety and reliability of the market. Further, by the solvency and purchase power of consumers, tendencies of increase or decrease of solvent demand in markets analyzed, market size, level of demand and supply, distance; economic, financial and political risks; market entering barriers and evaluation of the prospects.

Table 6.6. Market analysis of the exactly exported Lithuanian products

Quantitative information								
Criteria describing the export markets	*	Weights	Measuring units	Comparable export markets				
				Germany	UK	...	France	Poland
Volume of exports	S_1	q_1	m_1	x_{11}	x_{12}	...	x_{1j}	x_{1n}
Increase of exports	S_2	q_2	m_2	x_{21}	x_{22}	...	x_{2j}	x_{2n}
...	...	...	...	...	...	...	...	...
Export market share in the world	S_i	q_i	m_i	x_{i1}	x_{i2}	...	x_{ij}	x_{in}
...	...	...	...	...	...	...	...	...
Price level of the market	S_t	q_t	m_t	x_{t1}	x_{t2}	...	x_{tj}	x_{tn}
Conceptual information								
K_k	$K_ž$	K_q	K_m	K_1	K_2	...	K_j	K_n
After a multiple criteria analysis of the sectors, the following will be determined:								
Priority of the market for each product				P_1	P_2	...	P_j	P_d
Tendencies, i.e. the percentage of increase (or decrease) of the position of the exact market complex and the disposal towards which Lithuanian products during the period analyzed				E_1	E_2	...	E_j	E_d

*The sign Si (+/–) indicates that a greater/lesser criterion value corresponds to a greater significance for a exporter

On the basis of the COMTRADE database, a database of market analysis of exact exported Lithuanian product was formed (see Table 6.6).

During a market analysis of each of the exact exported Lithuanian product, such a database has to be filled in.

After a multiple criteria analysis of the sectors, the following will be determined:

- Priority of the market for each product. One can see which is the most suitable country for exporting of the exact product.
- Tendencies, i.e. the percentage of increase (or decrease) of the position of the exact market complex and the disposal towards which Lithuanian products during the period analyzed. Also, the percentage of increase (decrease) of the comparative advantages of the exact product (export conditions in the world and its production conditions in Lithuania).

According to these matrices it is possible to analyze in a complex way the markets analyzed, bearing in mind both the optimistic and pessimistic outcomes. Since the situation is changing each year, then after the formation of a database, the analysis can easily be repeated each year.

Having exhaustive conceptual and quantitative information, as well as the results of multiple criteria analysis of sectors, products and markets, as stated above, it is then possible to take them into consideration and more effectively carry out negotiations with the prospective importers.

6.6.4. The uses of internet in the ethical multiple criteria decision-making

6.6.4.1. Introduction

Many ethical qualitative and quantitative deci-sion-making models and methods (Cottone e*t al.* 2000; Robson *et al.* 2000; Doolittle *et al.* 1992; Greene 1993, etc.) have been deve-loped in the world. Cottone *et al.* (2000) pre-sent a comprehensive review of the ethical decision-making models' literature from the fall of 1984 through to 1998. Robson *et al.* (2000) re-view and consider several models of ethical problem solving. He argues that ethical decisions are reached through intuition, are informed by ethical principles, codes of practice and by ma-king references to the laws of a society. Doolittle *et al.* (1992) describe six principles that un-derlie the Herrick-Smith model for ethical de-cision-making: autonomy and respect, beneficence, nonmaleficence, justice, veracity, and confidentiality. According to Doolittle *et al.* (1992), their model is comprised of a series of steps: step one is the assessment, a process of value clarification, during which objective data is gathered; step two is problem definition, in which opposing ethical principles are identified; step three is planning, in which alternative responses to the dilemma are placed on a hierarchy according to ethical principles, the

values of key people, and projected outcomes, and a choice is made; step four is the implementation; step five is the evaluation; and step six is prizing, which calls for "cherishing the choice." Greene *et al.* (1993) proposed that their ethical deci-sion-making model have four levels: the societal context, the social policy arena, professional communities, and client-practitioner encounters.

Ethical problems, which arise in different spheres of peoples' activities, may be efficiently solved on the grounds of models of ethical decision-making.

According to Cottone I. (2000) whether one model is better than another is yet to be determined and in fact, the criteria for what makes a "better" model are not clearly defined in the field, and empirical comparisons are still lacking.

Usually, the interested parties find themselves in complex situations where the right ethical choice is unclear. In such situations, usage of a multiple criteria analysis can help the interested parties identify the course of action that will result in the greatest moral good.

According to the Internet's literature, Web-Based decision support systems have drawn the attention of researchers from a wide spectrum of disciplines. Web-Based Decision Support Systems can play a critical role, in ethical decision-making situations. A variety of questions have been analyzed by the authors in this research to determine which ethical problems can be sup-ported on-line. The results of this study provide a useful insight into creating ones own Web-Based Model of Multiple Criteria Ethical Decision-Making and Ethical Web-Based Decision Support System (EDSS). The proposed Web-Based Model of Multiple Criteria Ethical Decision-Making provides a logical, gradually guide to help in the creation of moral behavior.

The overall structure of the rest of this paper is as follows: Section 1, discusses the Web-Based Model of Multiple Criteria Ethical Decision-Making as was developed by the authors, Section 2, describes the Ethical Web-Based Decision Support System as was developed by the authors and Section 3, presents an example solution.

6.6.4.2. Web-based model of multiple criteria ethical decision-making

Corey *et al.* (1998) noted that because ethical codes cannot be applied in a rote manner and they are incomplete guidelines that reflect the values of the majority, practitioners are more likely to respond to a dilemma based on fundamental principles. The proposed Web-Based Model of Multiple Criteria Ethical Decision-Making is based on ethical principles of autonomy, beneficence, nonmaleficence, justice, and fidelity that are viewed as fundamentals of the stages that make up ethical decision-making. Al-so, the proposed Model is based on decision-making principles (i. e. principle of a life cycle's analysis, principle of the interrelation of various sciences, principle of multi-variant design and multiple criteria analysis of alternatives and principle of close interrelation between the alternative's

priority and the interested parties and their aims). The decision-maker' freedom of choice is stressed in the principle of autonomy. The stakeholder is encouraged to take responsibility for his/her actions and assess the effects of these actions on others. According to the principle of beneficence it is important to meet the integrated stakeholders needs, e.g. physical, economical, social, political, emotional, spiritual, etc. The principle of nonmaleficence is strongly linked to the principle of beneficence and means doing no harm to others. The principle of justice means the support of equal allocation of burdens and benefits (ethical, legal and other issues) among all stakeholders. Efforts are made to achieve a truthful, ethical and efficient solution, i. e. to optimize the life cycle of the alternative (principle of life cycle's analysis). The problems of truthfulness, ethics and efficiency of the solution may be successfully solved only when the achievements of various sciences, such as philosophy, ethics, Law, psychology, management, economics and aesthetics, etc. are used. The use of a principle of multi-variant design and multiple criteria analysis makes it possible to develop many alternative versions and carry out their ethical and other kinds of optimizations throughout life cycle of the alternative.

The above principles are landmarks of the proposed model and as support to solving the ethical dilemma. In different situations a few ethical principles sometimes oppose each other, and grading them are difficult.

According to Garfat and Ricks (1995), ethics is no longer about determining "right answers", but whether and how the decision maker decides what action to take. Ethical decision- making is a process governed by ethical principles. Also, when confronted with a complicated ethical dilemma that is not evidently analyzed in codes of ethics, the decision-maker should check with an ethical decision-making model.

Based on the analysis of the above ethical decision making models (Cottone *et al.* 2000; Robson *et al.* 2000; Doolittle *et al.* 1992; Greene *et al.* 1993; Tymchuk 1986; Walden 1990; Bombara 2002, etc.) a Web-Based Model of Multiple Criteria Ethical Decision-Making was developed by the authors of this paper. Some stages of the Model described in the paper (see Stages 1–3, 8, 9) are partly similar to the stages of the models proposed by some other authors. All other stages differ in principle, since the methods of multiple criteria analysis created by authors are applied and also, this Model is me-ant for the buildup of the Web-Based decision support system.

The proposed Web-Based Model of Multip-le Criteria Ethical Decision-Making provides a logical system and gradually guides and helps the user in the creation of acting in a way that includes moral behavior. These stages are the main steps of action and can be shaped into the framework of particular circumstances.

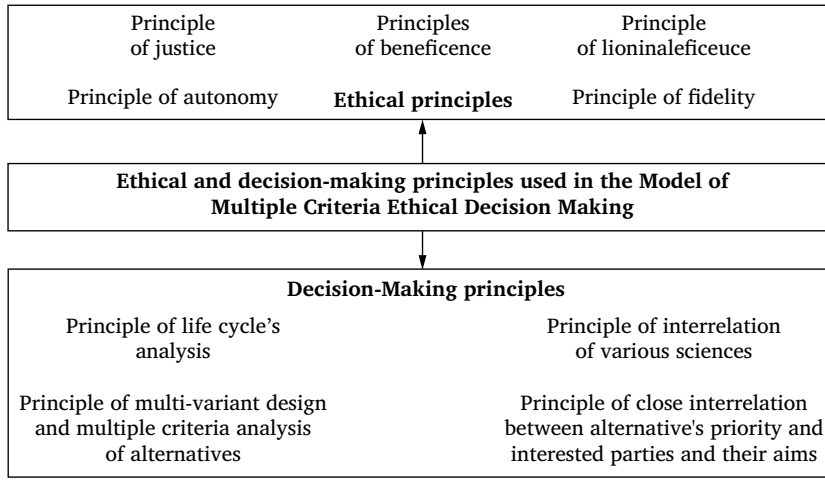


Figure 6.5. Ethical and decision-making principles used in the web-based model of multiple criteria ethical decision-making

The ten stages of Web-Based Model of Multiple Criteria Ethical Decision-Making are as follows:

Stage 1. Obtaining as much objective and subjective information (historical information, institutional, legal, societal expectations and limitations, ethical principles involved, identified conflicts, etc.) as possible. Further, if possible, the decision-makers have to develop suitable arguments on diverse aspects of the dilemma so as to have a high-quality perception of the range of concerns and advantages for each position.

Stage 2. Analysis of stakeholders. The stakeholders are identified as the interested par-ties who are directly or indirectly influenced by the decision that is to be made. For a better understanding of the current situation, discussions among the various interested parties are often necessary. Also, some ethical dilemmas can be prevented through dialogue between stakeholders. The discussion should engage all those who are the key stakeholders, some of who may be the decision-maker and some of whom may be influenced by the decision. The reaction that results from such discussions clears personal values while determining value conflicts. Stake-holders have to act as a team in an effort to come to some commonly suitable decisions. All stakeholders should accept some responsibility for the existing situation and have to be a part of any proposed decision. The personal values, theoretical orientation, experience and other stake-holder features play a part in achieving ethical decisions. Stakeholders have to analyze their own value judgments, religious beliefs, moral codes, experience with similar situations, and decide how to avoid injecting personal biases into decisions. Also, the decision maker must examine the values of others stakeholders.

Com-promises that may diminish harmful consequences should be analyzed. On the ground of the Model offered, decisions may be made from the viewpoint of one, several or all the interested groups.

Stage 3. Definition of the problem (conflicting ethical principles, value conflicts) and de-termination of the nature of the dilemma. Ac-cording to Joseph (1982), an ethical dilemma is a conflict in which a person must make a choice between several correct and conflicting decisions, generally with some negative consequences. Traditionally, dilemma (ethical, legal/moral, etc.) involves a choice between competing goods with possible harmful consequences. Assessment of a dilemma involves the detection of different conflicting ethical principles. Typical-ly, the ethical dilemmas are inherently problem situations that do not lead to easy decisions and there is no right or wrong one that can be easily recognized. Therefore, conflict between values of the different stakeholders leads to an ethical dilemma where there is no easy solution and no right or wrong answer.

Stage 4. Determination of the philosophy theories (e.g., utilitarianism, deontology, justice, etc.) according to which the alternatives will be evaluated and the decision made. Determination of the ethical ideal is made in concrete circumstances.

Stage 5. Search for the description of analogous typical situations in the available literature and a development of the best practice data-base.

Stage 6. Development of comparative tab-les (see Chapter 2). The aim at this stage is to build options for the decision, in preparation for making the ethical decision and arguing for the choice. Results of the generation of all possible courses of action have been submitted in the table. By submission, such a display, of the multiple criteria comparisons can become more effectively supported. As in any problematic circumstances, the stakeholders search for potential compromises by trying to find one that is most ethical and with the least negative consequences.

Stage 7. Evaluation of ethical alternatives. A decision maker must examine a large number of alternatives, each of which is surrounded by a considerable amount of information. Alternatives are analyzed along with the involved ethical principles and philosophical theories. The expectations and obligations of different stakeholders are then considered. Alternatives not satisfying some restrictions (i. e., the moral, legal, institutional, and societal expectations and constraints) are not further analyzed. Alternative solutions are compared in terms of the possible outcomes and according to the selected philosophical theories. Following on from gathering this information, the priority and utility degree of the alternatives is then calculated. The utility degree is directly proportional to the relative effect of the values and weights of the criteria and is considered on the efficiency of the alter-native. This helps a decision-maker to decide what alternative best fit

the situation that is un-der evaluation (i. e. the best solution achievable given the available resources and the circumstances of the dilemma). Several decisions will have priority and the choice is according to the preferences of different stakeholders and philosophy theories (e.g., utilitarianism, deontology, justice, etc.).

Priority of decisions depends a lot on whet-her one group or several interested groups make the decision, because different stakeholders bring diverse experiences, beliefs, and moral co-des into the decision-making process. The Ethical Web-Based Decision Support System (EDSS) developed on the basis of this model enables the analysis of alternatives from the viewpoint of different interested groups. Also, frequently time and financial and other resources are perceived to be more significant than ethical principles. However, there is seldom an ideal decision to an ethical dilemma.

Stage 8. Implementation of a course of action. Implementing the decision may be the most difficult stage of the decision-making process. Ethical decisions are individual choices that may not be shared with other stakeholders. The decision-maker may be in a solitary situation in implementing some decisions and willing to admit the consequences of a decision that is not supported by others.

Stage 9. Monitoring of the action and its outcome.

Stage 10. Rehabilitation of the external and ethically advantageous environment in order to avoid potentially conflicting situations or to diminish their negative impact. Truthfulness, ethics and efficiency of the solution depend on the micro- and macro-levels of the external environment. Macro-level factors of the external environment such as religion, the existing cultural, social, ethical dimensions of the country, the executed governmental policy, the society, economics and the Law (the labor law, etc.) influence the arising ethical problems and the ethical solution making. The micro-level factors (the stakeholders, the applied formal code of ethics, rules, criteria of ethical behavior, ethical standards, codes of conduct) stipulate the ethical solution making to a significant degree as well. Therefore, on the grounds of cumulative experiences it is suggested that there be changes under these possibilities of the surrounding environment in order to decrease the possibility of a conflict situation arising or to diminish their negative impact. Developing an ethical environment also provides a background for ethical questioning, significant exchange, informed decision-making, and human consensus, in which all stakeholders are satisfied.

The above-described Web-Based Model of Multiple Criteria Ethical Decision-Making can provide decision-makers with quite a secure means of making difficult ethical decisions. This model can also help stakeholders to make the best feasible decision in certain given circumstances. The proposed Model does not make ethical decisions, but explains the process for investigating a situation.

Table 6.7. Grouped decision-making matrix of ethical alternatives in a multiple criteria analysis

Quantitative information relevant to ethical alternatives										
Criteria describing ethical alternatives		*	Weights	Measuring units	Comparable ethical alternatives					
					1	2	...	j	...	n
Quantitative criteria	X_1	z_1	q_1	m_1	x_{11}	x_{12}	...	x_{1j}	...	x_{1n}
	X_2	z_2	q_2	m_2	x_{21}	x_{22}	...	x_{2j}	...	x_{2n}
	...	...	...	...	...	...	...	...	...	...
	X_i	z_i	q_i	m_i	x_{i1}	x_{i2}	...	x_{ij}	...	x_{in}
	...	...	...	...	...	...	...	...	...	...
	X_t	z_t	q_t	m_t	x_{t1}	x_{t2}	...	x_{tj}	...	x_{tn}
Qualitative criteria	X_{t+1}	z_{t+1}	q_{t+1}	m_{t+1}	$x_{t+1\,1}$	$x_{t+1\,2}$	...	$x_{t+1\,j}$	...	$x_{t+1\,n}$
	X_{t+2}	z_{t+2}	q_{t+2}	m_{t+2}	$x_{t+2\,1}$	$x_{t+2\,2}$	...	$x_{t+2\,j}$	...	$x_{t+2\,n}$
	...	...	...	...	...	...	...	...	...	...
	X_i	z_i	z_i	m_i	x_{i1}	x_{i2}	...	x_{ij}	...	x_{in}
	...	...	...	...	...	...	...	...	...	...
	X_m	z_m	q_m	m_m	x_{m1}	x_{m2}	...	x_{mj}	...	x_{mn}
Conceptual information relevant to ethical alternatives (i. e. text, graphics, video tapes)										
	C_f	C_z	C_q	C_m	C_1	C_2	...	C_j	...	C_n

* The sign z_i (+/–) indicates that a greater/lesser criterion value corresponds to a greater for a stakeholder

Based on the proposed Model of Multiple Criteria Ethical Decision-Making an Ethical Multiple Criteria Decision Support Web-Based System (http://dss.vtu.lt/ethic/index_eng.htm) was developed by the authors.

In order to throw more light on the subject, a more detailed description of one of the above mentioned stages (collection of initial data for a multiple criteria analysis) of the analysis are as follow. The determination of the ethical alternative's utility degree and the establishment of the order of priority for its implementation has fewer difficulties if the criteria values and weights are obtained and when multiple criteria analysis methods are used.

The results of the comparative analysis of ethical alternatives are presented as a grouped decision-making matrix where columns contain n alternatives, while all the quantitative and conceptual information pertaining to them is found in Table 6.7.

Quantitative objective (different cost factors, facts, expectations, legal constraints, ethical principles) and subjective (values, feelings, beliefs) information is based on criteria systems and subsystems, units of measure, values and initial weights of the ethical alternatives.

The presentation of information needed for decision-making may be in conceptual and quantitative forms.

Conceptual information is a more flexible but less accurate means of expressing estimates than when using numbers. Quantitative information is more accurate and reliable and allows one to use multiple criteria decision-making methods.

The information's grouping in the matrix should be performed so as to facilitate the calculation process and to express their meaning. When developing a decision-making matrix it is efficient to make complex use of several ethical theories that best correspond to the issue that is under consideration. For example, deontological ethics is strongest in many areas where utilitarianism is the weakest area. Each of these theories emphasizes certain moral worth that sometimes contradict other theories.

According to utilitarianism, all consequences must be measured and weighed. Positive and negative consequences may be defined in terms of pleasure, happiness, ideals and preferences. For any given action, utilitarianism is calculated for all the available alternatives, e.g. how many people will be affected, negatively and positively and how intensely they will be affected? Pleasure and preference satisfaction are easier to quantify than happiness or ideals. Some con-sequences (love, family, etc.) cannot easily be quantified, while other aspects (productivity, material goods) may be emphasized precisely because they are quantifiable.

When utilitarianism considers the issue of consequences, it analyzes who is to be included within that circle. Who will decide what is good or evil, right or wrong for each particular group? Who does the calculating? Typically, the calculating differs depending on who does the counting.

Many people think that people, who keep to ethical principles and rules, make ethical decisions, whereas the decisions made by persons who pay less attention to these principles and rules, are less ethical. However, the ethics of these solutions is greatly influenced by the number of analyzed alternatives, the exhaustiveness of the criteria, which define the alternatives, and other factors used for ethical solution making. For example when a moral, less educated person has evaluated only several influencing factors, after having analyzed 5%

of alternatives. A less moral, but well-educated person will have specified all the influencing factors, after having analyzed 95% of alternatives. Which one of them will make a rational truthful, ethical and efficient solution? Thus, so as to increase the truthfulness, ethics and efficiency of the adopted solution, education in the field of ethics should be expanded and then the latter would serve as grounds for the stimulation of moral perfection.

The creation of alternatives and the evaluation of values and weights of descriptive criteria serve as one of the most important stages in the determination of rational alternatives. There are always many alternatives in the course of ma-king an ethical decision. For example when aiming at helping children who have been adopted by a children's home and for whom we can gather donations, invite to our homes for a celebration of different festive occasions, spend summer holidays together and/or create an external micro- and macro-level environment, which actually creates better living conditions for the children.

The developed alternatives should also me-et certain restrictions, e.g. are the rights respected? Are the duties performed? Is justice observed? The alternatives, which do not meet these restrictions, are here not analyzed any further.

The systems of criteria are developed so that the values and weights of these criteria are evaluated on the grounds of ethical theories, the legal system, formal codes of ethics, rules, criteria of ethical behavior, ethical standards, codes of conduct, use of experts and other methods.

Different criteria may be analyzed, depending on the goals of the stakeholders, i. e. efficiency, non-violation of rights, execution of duties, up-holding the given promise, honesty, upholding professional values, loyalty towards the place of employment and friends, conformity of behavior with social demands, the current and future number of the active stakeholders, the level of resistance towards the implementation of the adop-ted decision, seeking for a more interesting and/or better paid and a virtual job or for a higher position and social acknowledgement, etc. As one may see, the possibility of a smaller or a larger conflict-of-interest between the stakeholders always exists due to the availability of such a large variety of criteria of ethical behavior and demands from the stakeholders. The more active these stakeholders are, the greater the possibility for the appearance of new ethical problems. On the other hand, if large ethical problems exist, principal upholding of all ethical principles and rules causes a certain risk. Such a situation may lead to an increase of internal moral tension with all the consequences ensuing from there (e.g. a bad mood, sleepless nights), to the breaking off of a friendship and cooperation with other stakeholders or to the aggravation of career perspectives.

According to Brans (2002), it is crucial to have the Ethical weights well defined. Who is going to fix them and what are the responsibilities? A group of Independent Experts can possibly advice the Decision-makers (Brans 2002) in

these and similar situations. Hundert (1987) pointed out the difficulty of articulating the process by which the worth of one value is balanced against another.

In the course of decision-making, a higher priority is given to certain moral values, where-as less attention is drawn to other ones. While estimating the weight of the criteria, one should determine which demands of the stakeholders are more significant and to which extent and which criteria of ethical behavior, etc. is more significant.

The positive and negative qualities of alter-natives are vividly reflected in the developed de-cision-making matrix. After having performed a multiple criteria analysis of the possible alter-natives then the rational variants, which can be practically implemented, are determined.

The priority and utility degree of the comparative versions can be determined, after one has created alternatives and calculated the values and weights of the descriptive criteria in the course of the application of the methods of multiple criteria analysis.

6.6.4.3. The ethical web-based decision support system

In consideration of the popularity and spread of the Internet, Web-Based decision support systems may be used practically all over the world. With reference to ethical decision-making models it is possible to solve ethical problems, resulting in various fields of human activities, in a more effective way. Some people study and apply different ethical theories in practice. It goes without saying that a person doing that feels much stronger as if he/she is sharing in the moral responsibility with these theories.

The majority of moral problems are repeated a thousand times. When a child watches television all day long or plays computer games, he/she may harm his/her health. An employer treats his/her employees incorrectly. A husband and a wife argue over various issues. Such or very similar situations occur in life very frequently. There are many possible miscellaneous variations on how to act in these situations. How should one act in any situations similar to these and what kind of decision is more truthful, ethical and efficient? There is the Web-Based Mo-del of Multiple Criteria Ethical Decision-Ma-king that can be used to solve such problems or other practical ethical problems.

Barthélemy *et al.* (2002) emphasize the role of human factors in Decision Support Systems and the related assisting tools that can be used in the Operational Research field, which links both historical information and real life realizations concerning the human centered processes.

Based on the proposed Web-Based Model of Multiple Criteria Ethical Decision-Making an Ethical Multiple Criteria Decision Support Web-Based System (http://dss.vtu.lt/ethic/in-dex_eng.htm) was developed by the authors. The Ethical Multiple Criteria Decision Support Web-Based System (EDSS) consists of a

data-base, a database of best practice, a database management system, a model-base, a model-base management system and user interface.

Main stages of the developed Model of Multiple Criteria Ethical Decision-Making and their relation with EDSS are presented in Figure 6.6. According to the Web-Based Model of Multiple Criteria Ethical Decision-Making developed be the paper's authors, possible alternatives are firstly determined and described in a quantitative and qualitative form (1–3 stages). In this way, the initial database for problem analysis was de-signed. In order to evaluate the worldwide practice of this problem's solution, the best practice database was developed (4th stage). According to the 5th stage of the Model, it is possible to choose the philosophical theories as a base for the analysis of developed alternatives in the form of a decision-making matrix. The alternatives may be analyzed according to one theory of philosophy (deontology, utilitarianism, justice) or their combinations (see Figure 6.7). By performing an analysis of the alternatives, the necessary information is obtained from the initial data-base and the database of best practice and is inserted into the decision-making matrix (6th stage). At the 7th stage the analysis of alternatives is performed with the help of EDSS.

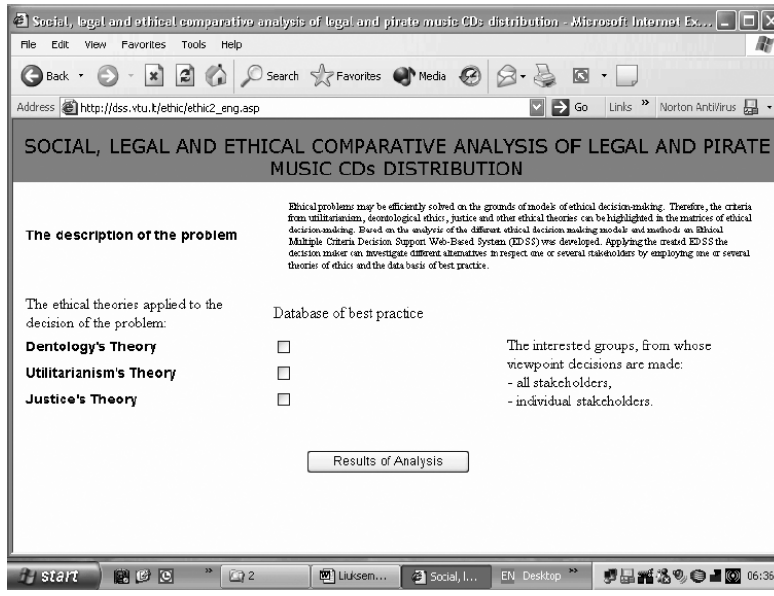


Figure 6.7. Analysis of ethical alternatives according to one philosophical theory or a combination of theories

In order to select the most truthful, ethical and efficient decision the 8–10 stages of the developed model and the EDSS may be used as well. For instance, when implementing the stages 8–10 of the Model various difficulties and

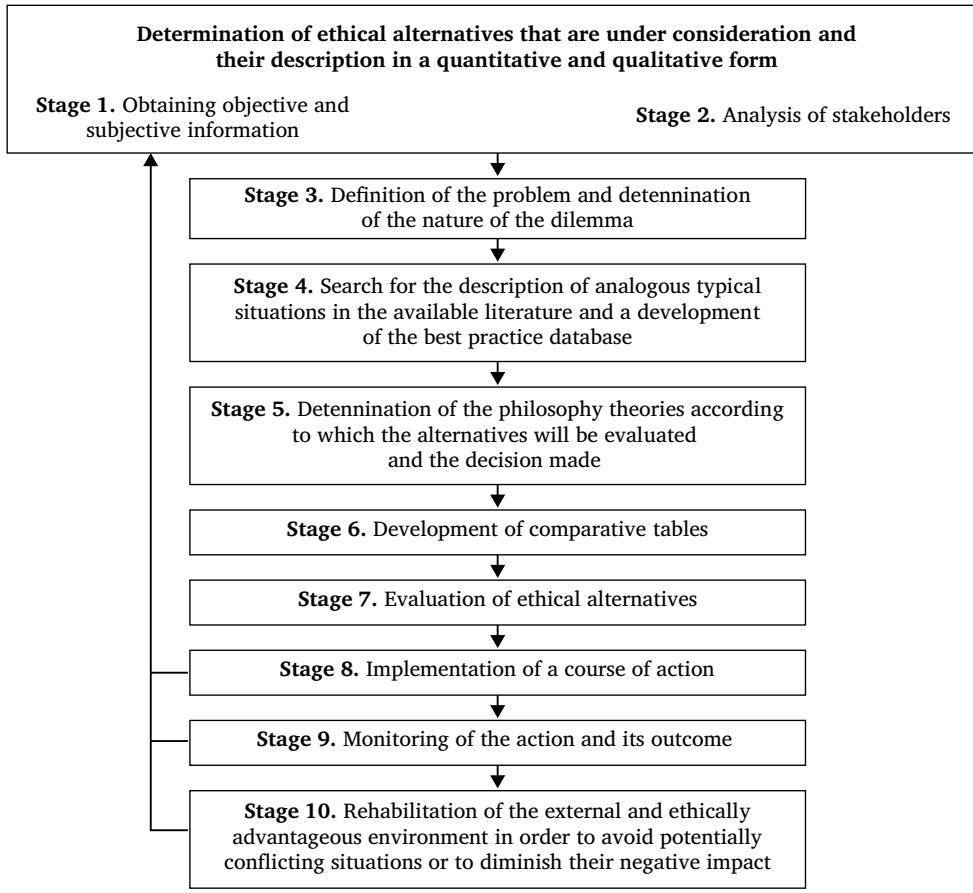


Figure 6.6. Main stages of the developed Web-Based Model of Multiple Criteria Ethical Decision-Making and their relation with EDSS

unforeseen circumstances may occur, the situation may change in due course of time. Aiming at reacting to a new situation more effectively or at solving problems ratable alternatives are to be made anew turning back to the first stage of the model. The alternatives are described quantitatively and qualitatively referring to the current situation and the available best world wide experience (see stages 1–4). On developing the matrix of decision-making the alternatives are estimated according to the selected theories of philosophy (see stages 5–7). In that case, as the situation has changed, the procedure chosen in the stages 8–10 of the model is possible to be analyzed and a truthful, ethical and efficient decision is to be made applying EDSS.

A short description of the EDSS follows.

The developed EDSS is bilingual. The Lithuanian and English languages can be used. Presently, the system contains three functioning samples (http://dss.vtu.lt/ethic/index_eng.htm) with databases made specially for them. There is also a possibility to introduce additional samples and a database of the best practice on the main website of the system. This extra information is possible to be introduced in any part of the world with a system administrator's consent. As Figure 6.7 indicates, these samples are possible to be analyzed referring to three theories of philosophy (deontology, utilitarianism, justice).

The presentation of information needed for decision-making in the EDSS may be in conceptual forms (i. e. digital/numerical, textual, graphical, diagrams, graphs and drawing, photographic, sound, video) and quantitative forms.

The presentation of quantitative information involves criteria (quantitative and qualitative) systems and subsystems, units of measurement, values and initial weights that fully define the provided alternatives. Conceptual information means a conceptual description of the alternative solutions, the criteria and ways of determining their values and the weights, etc.

The character of the objective's choice for the most efficient alternative is largely dependent on all available information. It should also be noted that the quantitative criteria are objective. The actual ethical decisions have real costs. The values of the qualitative criteria are usually rather subjective though the intervention of experts with various methods may enhance the objectivity in judgment.

In this way, the EDSS enables the decision-maker to receive various conceptual and quantitative information on ethical decision making from a database and a model-base allowing him/her to analyze the above factors and to form an efficient solution.

The user seeking for an efficient ethical decision solution should provide, in the database that is assessing the ethical decision solutions, the exact information about alternatives that are under consideration. It should be noted that various users making a multiple criteria analysis of the same alternatives, often get diverse results.

This may be due to the diversity of the overall aims of the users. For example, Kilner (1990) examines the ethical basis for selecting which patients will receive medical treatment if there are not sufficient resources to treat all in need. Sixteen patient-selection criteria were identified by Kilner (1990) on the completion of a large survey of American medical directors: the social value of the patient; favored group status (children, or veterans, for example); resources required for treatment; special responsibilities of the patient (heads of household, for example); age; psychological ability; supportive environment; medical benefit; likelihood of imminent death; likelihood of benefit; length of benefit;

quality of benefit; willingness to cooperate in treatment; ability to pay; random selection; and experimental nature of the treatment.

Therefore, the initial data provided by various users for calculating the ethical decision differs and consequently leads to various final results. However, if all stakeholders prepare the initial data for an analysis jointly, it increases the effectiveness of the decision-making. Thus, the creation of a data base of typical ethical problems, their solutions (possible alternatives; the system of criteria, which describe the alternatives, their values and weights) and the typical rules of decision-making, for example, "'Treat others in the same way as you would like to be treated by them", "Justice is a subjective matter", "Do not cause harm" is rational.

Based on the necessity to include theses aspects, this database can be used in the process of practical decision-making. For example, by taking into consideration the understanding that "Justice is a subjective matter", one may draw the conclusion as follows: it is advisable to deal with those people, who have the same outlook, who refer to the similar values, who strive for the similar goals and whose characters and temperaments are in line. In this case, objective conditions will be created for decreasing different ethical problems that could arise.

The interested parties have their specific needs. Therefore, every time the party uses the EDSS they may make corrections to the database according to their aims.

The model-base of the EDSS should include models that enable a decision-maker to do a comprehensive analysis of the available alternatives and to make a proper choice.

The following multiple criteria analysis methods and models as developed by the authors (Zavadskas and Kaklauskas, 1999) are used by the EDSS in an analysis of ethical alternatives (see: http://dss.vtu.lt/ethic/index_eng.htm):

1. A new method and model for a complex determination of the weight of the criteria taking into account their quantitative and qualitative characteristics was developed. This method allows one to calculate and co-ordinate the weights of the quantitative and qualitative criteria according to the above characteristics.
2. A new method and model of multiple criteria complex proportional evaluation of alternatives enabling the user to obtain a reduced criterion determining the complex (overall) efficiency and the utility degree of the alternative was suggested. The method of complex proportional evaluation assumes direct and proportional dependence of significance and the utility degree of investigated versions on a system of criteria that adequately describes the alternatives and on values and weights of the criteria. The decision maker by using the experts' met-hods determines the system of criteria and calculates the values and initial weights of the qualitative criteria.

The management system of the model base allows a person to modify the available models, eliminate those that are no longer needed and add some new models that are linked to the existing ones.

Application of EDSS allows one to determine the strengths and weaknesses of the ethical alternatives. Calculations were made to allow one to find by what degree one alternative is better than another and the reasons are disclosed as to why this is namely so. Landmarks can be set for an increase in truthfulness, ethics and the efficiency of alternatives. All this can be done argumentatively and based on criteria that were un-der investigation as well as on their values and weights. This saved users' time considerably by allowing them to increase both the efficiency and the quality of the ethical decision analysis.

The created Ethical Web-Based Decision-Support System may also help stakeholders to manage their mutual relationship efficiently, to minimize the conflict-of-interest situations and to solve them.

In order to demonstrate the application of the EDSS a practical example of a multiple criteria analysis of marketing interviews alternatives is considered below.

6.6.4.4. Social, legal and ethical comparative analysis of legal and pirate music CD distribution

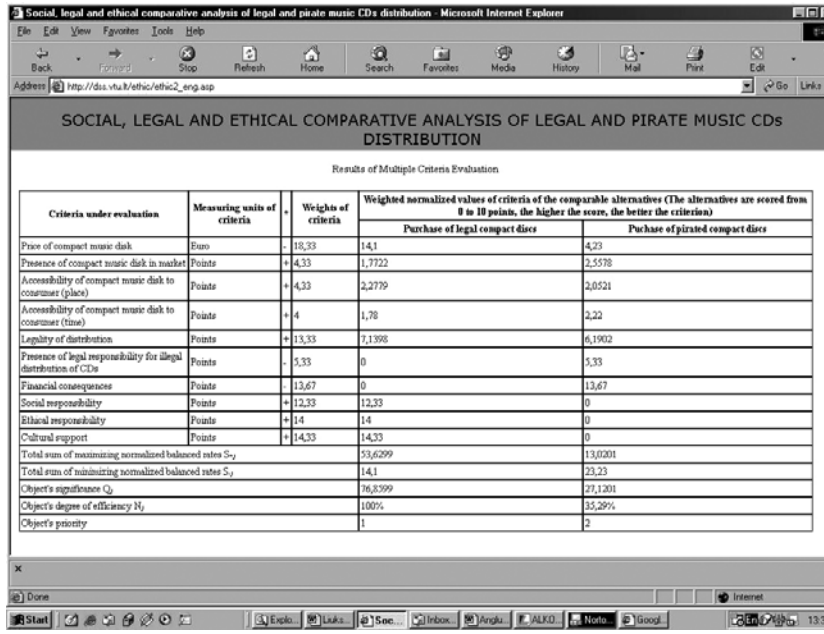
In order to demonstrate the application of the EDSS a practical example of a multiple criteria analysis of ethics' alternatives (purchase of le-gal compact and pirated compact discs) is considered below.

In September of 2001, after conducting a poll covering 1,000 respondents, it was established that during three summer months 15.9% of those interviewed bought compact discs and 19.6% of those interviewed bought music tapes. The results of the survey showed that 42.5% of those interviewed (buyers) bought illegally sold com-pacts discs. About the same percentage of respondents (buyer) bought pirated tapes. Thus, from 1,000 respondents 6,76% (15.9%*0,425 = 6,76%) bought illegally sold compacts discs and 8,33% (19.6%*0,425% = 8,33%) bought pirated tapes. Therefore, the situation is not go-od for the music people. What reasons lie beneath all such activities? Some of them are outlined briefly in the following paragraphs.

After legal music records in Lithuania pass through all tax payments, customs, profit tax, etc. and barriers that have been established by the state (some of which are justifiable while others are not) the price of music increases by 45%. In Lithuanian music stores, a foreign com-pact disc costs about LTL 48–70 (1 Euro = 3.45 LTL) while illegal dealers sell a disc for LTL 8–18. A compact disc in the USA several weeks after leaving the charts of the most popular and trendy records costs $5, which is about the price of one hamburger. In Germany, Italy, or France a CD costs about 5–11 Euro. Therefore, an ordinary buyer of

recorded music understands that it is wrong to help pirated product distributors earn high profits but nevertheless buys the illegal products. He/she has one well-founded argument: his/her (i. e. music lover's) buying power is so low and the price for foreign CD's and local CD's, which until recently local have also been very expensive, and because both are so high in price, he/she simply has no other choice.

Table 6.8. Fragment of multiple criteria analysis of ethical alternatives



Criteria under evaluation	Measuring units of criteria	*	Weights of criteria	Weighted normalized values of criteria of the comparable alternatives (The alternatives are scored from 0 to 10 points, the higher the score, the better the criterion)	
				Purchase of legal compact discs	Puchase of pirated compact discs
Price of compact music disk	Euro	-	18,33	14,1	4,23
Presence of compact music disk in market	Points	+	4,33	1,7722	2,5578
Accessibility of compact music disk to consumer (place)	Points	+	4,33	2,2779	2,0521
Accessibility of compact music disk to consumer (time)	Points	+	4	1,78	2,22
Legality of distribution	Points	+	13,33	7,1398	6,1902
Presence of legal responsibility for illegal distribution of CDs	Points	-	5,33	0	5,33
Financial consequences	Points	-	13,67	0	13,67
Social responsibility	Points	+	12,33	12,33	0
Ethical responsibility	Points	+	14	14	0
Cultural support	Points	+	14,33	14,33	0
Total sum of maximizing normalized balanced rates S_{+j}				53,6299	13,0201
Total sum of minimizing normalized balanced rates S_{-j}				14,1	23,23
Object's significance Q_j				76,8599	27,1201
Object's degree of efficiency N_j				100%	35,29%
Object's priority				1	2

Under Lithuanian law, when the legal value of illegally produced or sold storage media is higher than 43,000 LTL, the person can be sen-tenced to up to two years imprisonment for breaking this law.

Also, it should be taken into account that Lithuanian residents' salaries are not very high. The average salary of a Lithuanian employee makes up to only 370 Euros. Further, salaries in cities are higher, but in villages are less.

By taking into consideration the above-mentioned factors we can see that an evaluation of the purchase of legal compact and pirated com-pact discs from the ethical point of view is not so unambiguous. From one side, all purchasers would like to behave ethically, however, a comparison of the high prices of compact discs and the not so high salaries shows a reduction of this wish. The final choice is predetermined by other factors as well, such as living experiences, educational background and distance to the nearest compact disc shop, etc. This ethical problem is not typical of the well off, as they mostly acquire legal compact discs.

It is necessary to underline that the example being examined in this chapter is a broad-brush view of Vilnius. Results of an analysis of every individual's case may be different depending on the specific situation.

The multiple criteria analysis of the buying of legal compact and pirated compact discs ethical alternatives is described below.

The following criteria for determining the greatest moral good alternative is based on extensive literature study (Tan 2002, etc.), interviews and experts' opinions (see Table 6.8). They are as follows: accessibility of compact disk to the consumer (price of compact music disk, presence of compact music disk in the market, accessibility of compact music disks to consumers (place), accessibility of compact music disk to consumers (time); legality of compact disk distribution (legality of distribution, presence of legal responsibility for illegal distribution of CDs, financial consequences); social and ethical responsibilities for compact disk distribution (social responsibility, ethical responsibility, cultural support).

All the above criteria are qualitative except for the cost. Determination of the cost is based on average prices in black market and shops. The process for determining the criteria's initial weights and the qualitative criteria's numerical values of the alternatives that are under investigation was based on the use of interviews and an expert's method. Experts estimated the qualitative criteria by using a ten-point system. In this case, the experts have assigned 10 point to the best values of qualitative criteria and 0 point to the worst ones. All the other values of qualitative criteria were rated in the interval from 0 to 10. Further, this information was sub-mitted by experts and was processed by applying expert methods.

Parkes (1995) argues that the following ethical criteria should be satisfied in all interviews: the researchers should receive no personal gain, individuals should not be pressured to participate, interviewers should be trained in the support of bereaved persons, interviews should be supervised, and confidentiality should be ensured. Other criteria include the minimization of stress during the interview and the provision of rigorous methodology.

Semi-structured and open-ended question interviews were used as the means for questioning a diverse group of respondents who live in Vilnius (Lithuania) and to describe their expectations and experiences during their buying of legal compact and pirated compact discs. Twenty eight persons took part in face-to-face interviews: four interviews with couples and twenty with individuals were completed. Interviewees were selectively sampled within the black market area (11/28), compact disc shopping centers (11/28), and with referrals from other interviewees (6/28). To maximize the range of possible experiences and opinions, we included persons of diverse ethnicity, education levels and age and gender status. Interviewees were asked about their buying of legal compact and pirated compact discs experiences, etc. After questioning 28 respondents and

processing the obtained results by using an expert's method, values of qualitative criteria and initial criteria weights were calculated.

The results of the comparative analysis on the buying legal compact and pirated compact discs alternatives are presented as a grouped decision- making matrix where lines contain alternatives, while all quantitative information pertaining to them is found in Table 6.8. The quantitative information is based on the criteria system, units of measure, values and initial criteria weights of the alternatives. The quantitative information is accurate and reliable and allows one to use multiple criteria decision-making methods. When the decision-making matrix is formed on-line then a multiple criteria analysis of ethical alternatives can be performed.

Currently, by using the EDSS the alternatives may be analyzed according to one, several or simultaneously three theories of philosophy (utilitarianism, deontology, justice). This problem was analyzed in regard to these three theories at once (see Table 6.8). It can also be seen from the data presented in the table 2 that each alternative has both positive and negative features.

Table 6.9. Short explanation of criterion "Presence of the Compact Music Disc on the Market" weight and values according to different ethical theories

Ethical theories	Units of measurement	Weight (q_i) of criterion according to different ethical theories	1. Legal compact music discs	2. Pirated copies of compact music discs
			Values (x_{ij}) of criterion according to different ethical theories	
Presence of the Compact music disc on the Market				
1. Deontology	Points	5	2	3
2. Utilitarianism	Points	3	3	S
3. Justice	Points	5	4	2
4. All above theories	Points	4,33	3	4,33

In this example scores measured all criteria, with the exception of the price. The price is measured in Euros. The magnitude of weight indicates how many times one criterion is more significant than another criterion for buyers of legal compact and pirated compact discs. For example, the cost (q10 = 0.7) is 2.33 (q10 : q8 = 0.06: 0.03 = 2) times more significant for buyers of legal compact and pirated compact discs than the prosecution risk (q8 = 0.3).

The following is an example that contains a short discussion on one of the criteria "Presence of the Compact Music Disc on the Market" (Table 3) and its

purpose is to provide a more explanation of this criterion weight and values given in Table 2.

Criterion values. Under the utilitarianism theory consumers should be provided with access to goods and services irrespective of obstacles. Therefore the availability on the market of pirated copies of compact music discs (provided the consumers are in no position to purchase them legally) under this theory is regarded more positively (X22 = 8 points) than according to the theories of utilitarianism and justice. The deontological theory, however, requires social responsibility and fulfilment of one's duties, therefore the assessment is not so favourable – X12 = 3 points. And the theory of justice which emphasizes adherence to laws gives only X32 = 2 points. In assessing the Presence of Compact Music Disc on the Market criterion (X42 = 4,33 points) on the basis of all three abovementioned theories, experts place more emphasis on the opportunity to purchase a product or service and not on the moral issues related to its acquisition (see Table 6.9).

Weight of this criterion. The theory of utilitarianism states that consumers should have access to goods and services and does not place so much emphasis on currently established moral, legal and other restrictions. Hence, those individuals who choose to follow this theory have broader freedom of choice in decision making. At the same time deontology requires that each individual be held considerably more responsible for the performance of his/her duties, it places more restrictions on individuals' choices in various spheres of activity. The theory of justice emphasises the superiority of the necessity to abide by laws and thereby restricts individual's choices within the framework of the relevant legal norms. Therefore the Presence of the Com-pact music disc on the Market criterion is more significant (5:3 = 1,67 times) when viewed from the perspective of deontology or theory of justice ($q_1 = q_3 = 5$) then as viewed from the utilitarianism perspective ($q_2 = 3$). When assessing the weight of the Compact music disc on the Market criterion under all three theories, eight experts who constantly keep corresponding theory (utilitarianism, deontology and theory of jus-tice) were interviewed. The analysis conducted on the basis of expert methods shows that the weight of the Presence of Compact music disc on the Market criterion under at once all three theories is $q_4 = 4{,}33$ (see Table 6.9).

As can be seen from the data given in Table 6.8, it is quite difficult to say which of the broad-brush alternatives within Vilnius is more ethical. The cost of legal compact disc alternatives is higher, while accessibility to compact music disk to consumers (place), legality of distribution, presence of legal responsibility for the illegal distribution of CDs, financial consequences, social responsibility, ethical responsibility and cultural support, were more favorable. The pirated compact disc alternative, however, differs from that of legal compact discs in that it possesses a lower cost, presence of compact music disk in the market

and accessibility of compact music disk to consumers (time), which were more positive compared with the legal compact disc alternative.

The results of a multiple criteria evaluation of ethical alternatives are presented in Table 6.8.

Table 6.8 shows that the first alternative (legal acquisition of compact discs) is the most truthful, efficient, ethical and the utility degree equals 100%. The buying of pirated compact disc's alternative was second according to priority, and its utility degree was equal to 35,29%. The level of the usefulness of the comparative alternatives expresses the level of the ability to reach a customer's goals.

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